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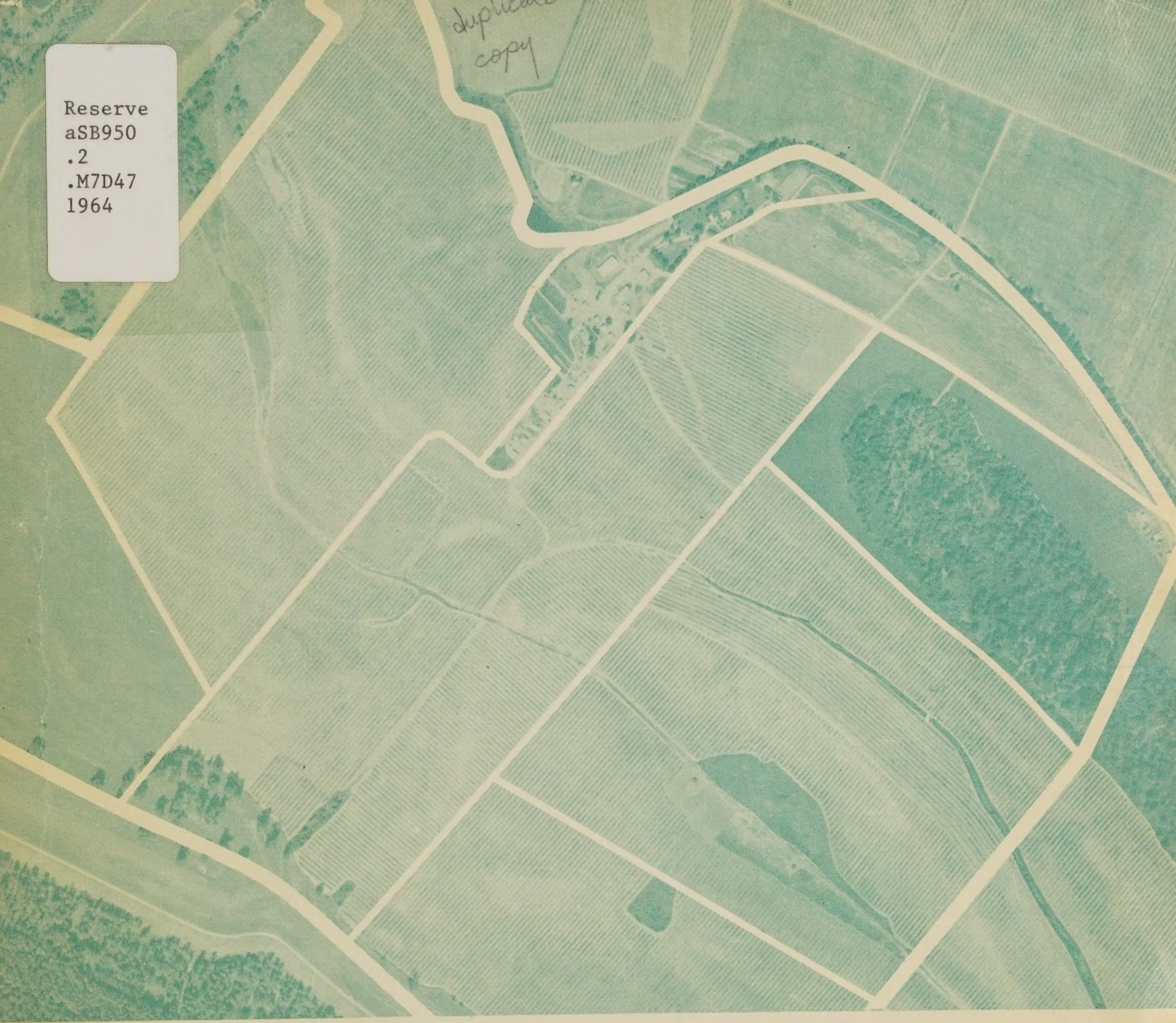

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IMPACT OF AGRICULTURAL PESTICIDES

ADMINISTRATIVELY CONFIDENTIAL

Determination of Impact of Agricultural Pesticides on the Environment

A Preliminary Report of Data Recorded from Greenville, Mississippi, location through December 15, 1964

Plant Pest Control Division
Agricultural Research Service
U. S. Department of Agriculture
Hyattsville, Md. 20781

December, 1964

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INTRODUCTION

To carry out its responsibility in monitoring the impact of the normal use of agricultural pesticides, the U.S. Department of Agriculture established a pilot study in the Mississippi River Delta in May 1964. The objective of the first year's operation was to determine existing pesticide residue levels in soil, water, crops, livestock, and certain species of aquatic and terrestrial animal life. Special attention was also given to pesticide impact on nontarget insects including bees and other beneficial species. The program in the Delta is to continue over a minimum period of three years in an effort to determine the rates of accumulation and depletion of residues in the various components of the environment.

The pilot program was established through close coordination of Departmental organizations interested in pesticide use. The Agricultural Research Service Divisions most active in the design and establishment of the program included Plant Pest Control, Entomology Research, Pesticides Regulation, Animal Disease Eradication, and Meat Inspection. Biometrical Services also assisted in planning the study. The Plant Pest Control Division was assigned the primary responsibility for conduct of the program.

To implement the program five locations, involving cotton, rice, and soybean production were selected in the Mississippi River drainage area: two in Arkansas and three in Mississippi. Each location contains two one-square mile areas. The areas are subdivided into blocks for sampling purposes. Samples are collected on a scheduled basis from different

components of the environment and chemical analysis run wherever pesticides residues are involved. Collections are supported by current pesticide use records, including materials used, amounts and methods of application. In addition, through cooperation of owners and operators, a pesticide use history is compiled for each area by year for the past several seasons. The program plan and guidelines for field activities give details of the operations.

Although the Delta program has been in operation only a few months, some gross observations can be made from results obtained thus far. Some of the more significant are:

1. Analyses of soil and water indicate that pesticide residues are not present at high levels in these agricultural areas having high pesticide use histories.
2. Despite the large quantities of pesticides applied in the study areas during the past season, there appeared to be little buildup of residues in soil during this interval.
3. Many samples of pollen have been found to contain pesticide residues; however, honey has been found to be free of the residues in all samples studied. Although there is no way to compare the bees placed in the area with colonies not exposed to pesticides, all colonies survived and surplus honey was produced. Prospects of the colonies going through the winter are fair.

4. Light trap catches ran over 1 gallon per night during the season of greatest insect activity. This would indicate that heavy pesticide use in the area is not creating a "biological desert" from the standpoint of nontarget arthropods.

Data accumulated thus far this year on the program in one location (Greenville) are summarized in attachments. Reports will be prepared on the remaining four locations as soon as possible. It should be pointed out that this is a preliminary report; results are not yet available in all phases of the work. Detailed analysis of the data from this location, as well as from other locations, will be made prior to next season's operations, including statistical examination of results wherever indicated. This should provide a basis for strengthening the work and for realigning it, if necessary, with the Department's current and future needs in monitoring the effects of pesticide use. It will also permit a more accurate evaluation of the results of the study.

Appreciation is extended to the Entomology Research Division for assistance given on arsenic analyses at the Kerrville, Texas, laboratory; for phosphate analyses performed by the Tifton, Georgia, laboratory; for confirmatory analyses performed at the Beltsville, Maryland, laboratories; and for most of the field work on bees, which was carried out by Bee Breeding Investigations, Baton Rouge, Louisiana.

Thanks are extended also to personnel of the Animal Disease Eradication Division for drawing blood samples from livestock for cholinesterase level

determinations and for "tagging" animals for later identification at slaughter. All blood cholinesterase level determinations, both in cattle and program personnel, were performed at the Brucellosis Testing Laboratory, ADE, Baton Rouge, Louisiana.

SOME CONSIDERATIONS FOR ALIGNING AND
STRENGTHENING THE DELTA MONITORING PROGRAM

1. Inasmuch as four areas (Wilson, Greenville, Scott, and Utica) involve cotton and soybeans as principal crops, consideration should be given to shifting either the Greenville or Scott location to another area of the South. These two locations are closely similar in crop practices and situated in a radius of about 20 miles. Priority areas which need monitoring include southern Alabama and the lower Rio Grande Valley of Texas. The Alabama area has a known history of dieldrin use in relation to potato and vegetable production. The Lower Valley has a high pesticide use history in relation to vegetable, citrus and cotton production. Drift is reported to be a major problem in the latter areas. While it is not possible, because of lack of funds, to establish operations in these new locations, shifting of one of the locations mentioned above would give the Department certain residue information, particularly on food crops, which will not be derived from the Delta study.

2. Some of the arthropod studies as conducted in 1964 appear to have little significance under conditions of the Delta study. Results from light traps, for example, show little difference between Areas A and B in any one location. An attempt was made to select indicators insofar as possible from insects which may have developed in the immediate one-square mile area. Due to the lack of true check areas and to the mobility of insects in general, the light traps results would seem to indicate little of significance other than that there is an abundance of nontarget insects in this region having a history of heavy pesticide use. The bee study is promising and the work will be expanded next year.

All phases of the insect studies should be carefully evaluated following statistical analysis and corrections and deletions made as warranted. It would seem that those species which live in intimate contact with residues in the environment, such as soil and water forms, would be more appropriate in this study. It is believed that the sampling is too limited in the pit-fall and soil insect study. These surveys will be both broadened and intensified. It should be pointed out that the biological work requires at least one-half of all the time devoted to field work.

3. Methodology in field sampling should be critically examined. It is apparent from examination of analytical results that the soil sampling method may need adjustment in order to obtain more representative samples. Tests are being conducted on efficiency of different sampling methods. Biometrical Services is assisting in this and in the examination of other sampling.

4. It is believed that the interval between soil samplings should be expanded from one month to three months. This would give a preseason, midseason and end of season sampling. By lengthening the interval, more samples could be taken at each interval. It is not recommended that fewer samples should be taken. In fact, more soil samples should be collected than in 1964.

5. The laboratory work should be strengthened through addition of necessary equipment and qualified personnel and improvement in procedures and methodology. Many improvements have been made as the work progressed.

6. Chemical analyses of arsenic were run on soil alone this year. It is planned, in the future, to study the arsenic content of diverse types of samples to determine if the old residues of arsenic occur in the various

media. In the 1964 soil study arsenic was found in almost all samples analyzed. It would seem that soil which has not had arsenic added may hold "natural" arsenic of around 4 or 5 p.p.m. In order to arrive at a figure which may be of value statistically, repeated analyses were run on the same block with the hope that an average value may be obtained. If one takes this level as normal or blank value, then it may be postulated that the higher levels are residues left from application of arsenic pesticides to crops predating the use of chlorinated hydrocarbons plus possible additions from current use of arsenical herbicides. Likewise, an area requiring considerably more attention is that concerned with residues of phosphate insecticides. Equipment is being acquired to provide analysis of samples for phosphate residues as is presently being done with chlorinated hydrocarbons. The present colorimetric analyses are too cumbersome and expensive to permit the detail of study that is desired.

7. Studies on pesticide drift should be intensified.

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[illegible]

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[illegible]

UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
Washington, D. C. 20250

PROGRAM PLAN
Determination of Impact of Agricultural Pesticides on Lower Mississippi River Area

Need for Program

Information derived from this program will be useful in formulating policy and conduct of operations in the pesticides use field, both within the Department and on the interdepartmental level. Federal agencies and their State counterparts may utilize the data in pesticide research, pesticide regulations, control recommendations and operations, and recommendations for other agronomic practices. These actions will benefit growers, operators, and food and feed industry as more will be known of the present risk of contamination of agricultural products. The chemical industry and applicators will find results from such studies useful in developing more sound practices in formulation and application. The consumer will be better protected through more complete knowledge of the agricultural pesticide residue situations in areas affecting his water and food sources.

The monitoring studies in the lower Mississippi River area will serve also as a pilot project for a nationwide agricultural monitoring program.

Purpose

The purpose of this program is to develop basic objective information for the Secretary of the U. S. Department of Agriculture and his cooperators for their use in agricultural pesticide consideration.

Objectives

A. To determine levels of pesticides in the following areas of the agricultural environment:

1. Soils

2. Water (in agricultural areas)

3. Agricultural and other food and feed products.

B. To monitor the same areas periodically to establish trends of depletion or accumulation of residues.

C. To study the impact of agricultural pesticides on nontarget organisms in the environment including beneficial, phytophagous and nuisance insects, and plants. Special attention will be given to indicator organisms to measure possible biological magnification of residues.

D. To record results of studies and develop reports for appropriate distribution.

Period of Operation

The program in the lower Mississippi River area should be initiated as soon as possible, not later than May 18, 1964. After initiation, it should be placed on a continuing basis as a part of the developing program for monitoring agriculture pesticides on a national basis.

Manpower and Equipment Requirements To Initiate Program

A. Manpower

1. Supervisory

2 specialists

1 chemist

1 field supervisor (entomologist)

2. Laboratory

4 chemists

4 technicians

3. Field (surveys and sample collections)

5 entomologists (supervisory)

10 assistants

Field personnel will be organized in crews of three. One crew will be assigned to each area for the duration of this season's work.

B. Equipment

1. Analytical - the best available, including gas chromatography, colorimetric, ultra violet, infra red, etc.

2. Survey and sampling

a. Five complete sets of entomological collecting equipment, including 10 light traps and other survey tools.

b. Five complete sets of equipment necessary for collecting and transporting soil, water, and biological samples.

c. Transportation - to be arranged.

Indicator Locations	Major Crops or Commodities	Principal Pesticides
1. Greenville, Mississippi (Location No. 1)	Cotton	Methyl parathion
	Soybeans	Endrin
	Livestock	BHC
		Toxaphene
		DDT
		Herbicides
		Defoliants
2. Greenville, Mississippi (Location No. 2)	Same as Loc. #1	Same as Loc. #1
3. Stuttgart, Arkansas	Rice	Aldrin (seed treatment)
	Soybeans	Herbicides
4. Mississippi County, Ark.	Cotton	Chlorinated hydrocarbons
	Soybeans	
5. Copiah County, Miss.	Cotton	Methyl parathion
	Vegetables	
	Livestock	Toxaphene

Procedures

I. Compile a pesticide use history on indicator areas selected above.

A. Through direct contact with farmers, Federal and State agencies concerned with pesticide use, industry, and others.

B. Through supplemental information from all other available sources including complete literature review.

II. Determine base levels of pesticide residues in soils, water, and agricultural products through study in indicator locations. Studies will be made in one-square mile (approximate) work areas, selected in predetermined locations. Selection of the locations will be based on their specialized pesticide use history (See Indicator Locations above). The one-square mile study areas will be typical of the agricultural practices carried on in the particular location. Two one-square mile areas will be selected in each location. Each area will be defined by a permanent boundary such as property line, drainage ditch, road, etc. The primary area will be one that has practiced intensive pest control, preferably over a long period of time. The replicate area will be in vicinity of the primary area. Wherever possible the second area will be one where less extensive use has been made of pesticides. The objective is to establish areas of greatest contrast in pesticide use practices.

The two areas in any one location will have essentially the same agricultural makeup; i,e., if cotton is the principal crop, the areas should contain this crop on a major scale. Each area will have a minimum of one stream or other composite drainage area such as a pond, slough, or drainage ditch.

The study areas will be divided and mapped according to present land use. Each land use area will be marked by a permanent or recognizable boundary such as turnrow, road, ditch, stream, property line, etc. Each land use area will be considered as a block, indicated as such by a code on an official map. For evaluation purposes, particularly from standpoint of statistical analysis, it is important that all sampling be done on a block basis; e.g., samples from cotton will not be collected and analyzed together with those from pastures in another block.

Detailed procedures for program operations are outlined in a separate work plan.

A. Soils:

(1) Collect and analyze composite samples from each land use block. Take two composite samples (25 cores) per block. Soil sampling will be done at monthly intervals.

B. Water:

(1) Sample and analyze runoff water from composite drainage sources (ponds and streams), two bottom, two top, two surface samples per body of water. Take a set of samples from 1 pond and 1 stream per area, 6 in each type of location.

(2) Take four silt samples (25 cores per sample) per area.

(3) Well and cistern water. Two samples per area (5 gallons per sample). Water and silt samples will be taken at monthly intervals or as indicated by farm practices.

C. Agricultural and other food and feed products:

(1) Take samples of foliage and other plant parts and run analyses for pesticide residues. Take at least 2 samples per crop or pasture per month or as indicated.

(2) It may be desirable to check domestic animals and animal products for residue accumulations. This phase should be undertaken if residues in soil, water, and crops indicate need.

III. After establishing base levels of residues in indicator areas, repeat sampling at predetermined intervals and run analyses as outlined under (II) above. For instance, repeat at three monthly intervals during growing season (July, August, September) then one sampling four months later (January), additional sampling after another three months (April).

IV. Determine impact of agricultural pesticides use on nontarget organisms in the environment through use of indicator species or groups.

(1) Beneficial insects.

(2) Nontarget phytophagous insects.

(3) Nuisance pests of man and animals.

(4) Nontarget plant life where defoliants and herbicides are used. This will serve as indicator of drift problem. (Other drift data will be taken from pasture samplings in regard to insecticides).

(5) Selected organisms as possible indicators of potentiation of residues.

A. Prior to treatment, if possible, establish base population levels through appropriate survey methods in primary and check areas using indicator species or groups listed above. Make observations on conditions of nontarget plant life.

(2) [illegible]

[illegible]

[illegible]

(3) [illegible]

[illegible]

[illegible].

III. All [illegible], repeat sampling [illegible] outlined under (II) above. [illegible] during [illegible] season [illegible] (January) [illegible] (April).

IV. [illegible] environment [illegible].

(1) [illegible].

(2) [illegible].

(3) [illegible].

(4) [illegible].

[illegible]

[illegible]

[illegible].

(5) Relocated [illegible] potential [illegible].

V. [illegible]

[illegible] methods [illegible]

[illegible].

[illegible].

B. During seasonal treatment period determine impact of programs on indicator species using same methods selected under A. In most cases surveys will be conducted at weekly intervals.

C. Record and evaluate data.

V. Progress reports will be submitted to PPC Division Director by the Regional Supervisor on a biweekly basis. Reports on results of the studies will be prepared and submitted periodically, or whenever significant findings are discovered, during the monitoring operations. At the end of this series of tests, a detailed report will be prepared on the overall program.

VI. The first year's study should develop a basic profile of the existing pesticide residue situation in this region. Subsequent annual studies patterned along the same lines as the preliminary work, will show trends of pesticide residues and certain side effects of pesticide use in the region.

PPC-ARS-USDA
May 25, 1964
(Revised)

REVISED

DETERMINATION OF IMPACT OF PESTICIDES ON LOWER MISSISSIPPI RIVER AREA

Guidelines for Field Operations

Background See Program Plan

Objectives

A. To determine levels of pesticides in the following areas of the agricultural environment:

1. Soils
2. Water (in agricultural areas)
3. Agricultural and other food and feed products.

B. To monitor the same areas periodically to establish trends of depletion or accumulation of residues.

C. To study the impact of agricultural pesticides on nontarget organisms in the environment including beneficial, phytophagous and nuisance insects, and plants. Special attention will be given to indicator organisms to measure possible biological magnification of residues.

D. To record results of studies and develop reports for appropriate distribution.

Procedures

Training. Each entomologist in charge of an area will be given training, prior to reporting to his area, in methods for collecting soil and water samples, operation of light traps, mice traps, making aquatic collections, counting flies on cattle and operation of the fly grid.

Areas and Blocks

An area is approximately one square mile (640 acres) of agricultural farmland that has been selected for study. Each unit has two such areas under observation, and will be coded for records as A and B.

A Block is a portion of the 640 acres, and is designated as such from actual farm use. It may be 40 or 100 acres, more or less, in pasture or cotton, or it may be fallow or woodland. The farm use of land will determine the size and number of blocks in an area. Each block will be given an assigned code number which will be the key to its identification.

1. Pesticide use records
   A. Contact owners or operators of each block in each indicator area and compile history.
      1. Complete EI T/Form No. 1 through interview with owner or operator. Submit two copies of form to Regional Office.
         a. Use one form per block per year.
         b. Start with 1964; compile year-to-date history only. Operations after this date will require additional recording.
         c. Then work backward through 1963, 1962, etc., as far as authentic records can be determined, to 1954 if possible. Use one form per block per year. Historical records may be difficult to obtain because of change of boundaries, lack of records, etc. When this situation is encountered, enter "no records available" under "Remarks" on the form and add comments if necessary.
   B. Supplement information gained from farm operators with other pertinent information that can be obtained from commercial pesticide applicators, county agents, research personnel, and other reliable sources. If supplemental information will not conform to format of form, enter it under "Remarks" or on the back of form.
   C. Record current pesticide use information. Use EI T/Form No. 1 and record data called for after each pesticide application. Complete one form for each block for each application.

5

6-A

6-B

7-A

II. Determine base levels of pesticides in selected study areas. First sampling should be complete by June 15. An additional set of samples will be collected by July 15 and each month thereafter throughout the season. See Program Plan for further information on duration of program.

A. Soils (Sample once per month)

1. Two samples will be taken per block at each sampling. One sample will be taken along a line diagonally across the block, the other sample along the other diagonal of the block at an angle to the path taken by applicators during treatment with pesticides. All soil sampling will be done with a 2-inch diameter soil corer provided for this purpose. Twenty-five (25) cores will represent one sample. The separate cores should be spaced equidistant along the diagonals without actual measurement.

2. The twenty-five cores will be taken to a depth of 3 inches each and placed in a bucket provided for this purpose. When all twenty-five are taken, care being taken not to get samples from different blocks mixed up, they will be screened thru a 1/4" screen also provided. Stones, roots, twigs, grass, etc., will be discarded from screen. After all soil has passed through screen once, it is again passed through in order to mix the soil as thoroughly as possible. A gallon container is then filled with the mixed, screened soil and sealed with an air-tight lid. The container is labeled with sample number and date. Be sure proper label is on each. Attach after filling. An envelope containing data sheet describing the sample is fastened to outside of container with scotch tape. Be sure that both empty and filled soil containers are <u>not</u> exposed to pesticide contamination.

3. Ship sample to laboratory.

B. Water: Pond, stream, lake, ditch. (Sample water once a month or as deemed necessary).

1. Sub-surface water

a. A hand pump will be used to draw sub-surface water directly into the sample bottle, a 5-gallon carboy. This should be a 2-man operation; one man holding the suction hose of the hand pump and gradually moving it back and forth with the inlet a few inches below the surface, the other person operating the pump and directing the outlet into the sample bottle.

b. One sample will be taken in each sampling period. The area to be sampled should be split in halves and water taken from the midpoint of each half. If a boat is required, it should be used; otherwise, the sample should be taken from the bank. There are a number of advantages in taking the sample from the boat, the most important of which is that the boat may be in motion as the sampling proceeds and thus a more representative sample obtained.

2. Bottom water

a. To obtain the bottom sample, the pump suction hose should be fastened to a pole which will comfortably reach the bottom. The inlet of the hose should be fastened one foot from the bottom. Then, as the second man operates the pump, the first man slowly moves the pole along the bottom. A certain amount of silt will be stirred up in this operation and will find its way into the sample jug. This need not be a concern of the sampler.

b. If a boat is used to take the bottom sample, the pole may be dragged behind the boat as the boat coasts along. The extra

length of the pole below the intake will help maintain the distance above the bottom.

Note: If the water source is 3 feet or less deep, combine the sub-surface and bottom water sample, making only one sample.

3. Surface water

   a. A funnel-shaped float or other apparatus provided for this purpose will be used to take surface water. If the float is used it will be attached directly to hose so that all water entering hose comes from the surface of the pond or stream. The sample may be taken from the bank by attaching a long pole or bamboo rod to funnel so that it may be moved back and forth along the surface. A broad flat scoop may be used to take surface water from representative area. Take one 5-gallon sample per period in area suitable for this method.

4. Well and cistern water

   a. Take one 5-gallon carboy sample from wells in area, 1 gallon per well. If more than 5 wells in area, limit sample to that number.

   b. Take one 5-gallon carboy sample from cisterns (if available) in area, limit collection to 5 cisterns (1 gallon per cistern).

   Note: Water bottles come to the field sterilized and sealed. When they are filled, wrap the cork in aluminum foil and plunge it tightly in the mouth, then fold foil down over lip. Next, place another piece of foil over top of seal and fasten securely. Extreme care will be exercised at all times to protect water samples from contamination.

5. Silt and sediment (sample once per month).

5
6-A
6-B
7-A

a. The silt and sediment will be the most difficult to obtain with any uniformity. The best procedure is to use a soil corer with a long handle. The soil corer will be driven into the bottom far enough to just reach solid earth. It may then be withdrawn and the core emptied into the sample container. The water brought up with the mud may be decanted as it separates out. A sample will consist of 25 two-inch diameter cores of silt. If the silt is deep, it should be sampled in its entire depth so 25 cores will vary considerably in deep silt. For this reason, it may be necessary to take a large container, say a 5-gallon pail, as a collecting vessel. After all the cores have been taken and the water decanted, a stick or dowel may be used to completely mix the silt in the sampling container; then, a 1-gallon representative part is transferred to the gallon sample pail for submission to the laboratory.

6. Labeling

The sample containers should be identified with labels provided. The label should be tied or taped to the carboys and fastened to the cans with scotch tape. The gallon sample pails, prior to use, should have a manila envelope fastened to the side with scotch tape. Into this envelope will be placed a duplicate label. DO NOT get the wrong label on a container.

7. Data sheets

Data sheets will be executed in their entirety and will accompany <u>each</u> sample. It is extremely important that this be done inasmuch as data sheets will be used throughout the analytical procedure to accompany the sample so that the analyst may make pertinent remarks and record final analyses data on these sheets. These will then become a permanent part of the analytical file.

8. Remarks

On the data sheets, there is space for "Remarks." The sampling team should make use of this to advise the analytical staff and data processors of any unusual instances or happenstances in connection with the sampling. Examples that are important are: unusual contamination, such as spillage in the stream, accidental treatment of the water area, unusually heavy rains, extremely low water, extremely high water, high water draining adjacent land not normally a part of the drainage system.

9. Ship sample to laboratory.

C. Agricultural and other food and feed products

All crops should be sampled immediately before or at time of harvest. Harvest will be considered any usage of crop in which it might find its way into food for animal or man.

It must be understood that the principal weak point in determination of residues on crops is that of obtaining a representative sample. This problem is magnified in the monitoring effort now under way in that instead of the usual small experimental plots, the sampling must now be done on a block as much as a hundred acres in size. Only the extreme care and vigilance of the persons taking the samples can overcome this almost insurmountable problem.

The following directions are guidelines rather than rigid barriers to individual consideration. If departure is made from these guidelines, it should be so indicated on the back of the sample sheet with the reason for such departure. The staff which must interpret the results must have all pertinent data to make this study meaningful. Any data bearing on the problem of sampling must accompany the samples so affected. Do

[illegible]

[illegible]

[illegible]

[illegible]

not trust to memory and, above all, do not send a separate memorandum after the samples are taken. The separate memorandum may never reach the person who must have the information. If approval of a procedure is desired before sampling, it should be done by phone or memorandum, and this fact should be so indicated on the data sheets. If a change seems desirable in the guidelines that follow, this will be done by issuance of new pages. Upon receipt of changes, the old directions should be discarded.

Follow instructions of supervisors for handling and shipment of perishable products. Always be sure to freeze perishable specimens immediately after collection and keep them frozen until they reach the laboratory.

Guidelines for sampling of individual crops:

1. Hay, forage, pasture.

A sample will consist of 10 pounds of the crop. The first should be taken along a diagonal over the field from about 5 equidistant spots over its entire length. The second should be taken along the other diagonal.

The crop should be cut with a forage cutter, provided for this purpose, with extreme care so that the cut forage does not get in contact with the soil. The soil may be contaminated with an insecticide not present on the forage.

The forage cutter will cut more grass than is needed if a swath is cut completely across the field; therefore, with a little care and thought, the length of diagonal can be calculated and only as many sampling spots cut as needed for the 10 pounds of grass. This is done by cutting grass for a certain number of paces, skipping the next increment of paces; then cutting for the same number as the first cut. Then, skip the same number of paces skipped first and so on but continue across the entire two diagonals of the field.

The accumulated cuts are then placed in a plastic bag inside a canvas bag, <u>weighed</u>, labeled, and sent to the laboratory. The data sheet should be placed in an envelope between the plastic bag and the canvas bag. The identifying label should be tied to the mouth of the bag. The weight at time of sampling is important. This may be the gross weight of bag and sample; if so, a notation should be made on the data sheet as to empty bag weight, also.

The labels on the two diagonals of any one field are identical. This is understood. The laboratory will work these up as duplicate samples.

2. Cotton:

The mature cotton plant at time of harvest should be sampled. Also, seed from the picked cotton should be obtained.

a. Plants:

Ten pounds of plant material is desired. This is equal to about 10 mature plants. To get this, an estimate should be made of the number of rows in the field. This should be so divided that 10 evenly spaced rows are selected, starting several rows from the end of the field. The sampler should walk into the field, 5 paces on the first sampling row and cut off cotton plant 6 inches from the ground with a corn knife or machete. On the next sampling row, the sampler should walk in one-tenth the distance across the field; on the third sampling row, two-tenths the distance. On the fourth, three tenths, and so on. When 10 cotton plants are obtained, they should be cut into pieces small enough to fit in the plastic bag as used for forage. For the other sample from the field, repeat this procedure but be sure to start at opposite corner of field. The bag should then be weighed, labeled, and provided with data sheet.

b. Seed:

If necessary, the sampler should accompany the cotton to the gin. Ten pounds of seed should be obtained with care, making sure the seed comes from the field under study. Remember that much seed may remain in the gin from the previous ginning so time should be allowed for this to be run out before the sample is taken.

If the sample is taken from seed being returned to the farm, care should be taken to obtain the 10 pounds from many parts of the load so that it will be truly representative.

It is then placed in plastic bag, weighed, labeled, and provided with data sheets.

3. Corn:

The corn should be sampled in the same manner as the cotton, using 10 corn plants as one sample. Two samples should be taken. The time of harvest will vary, depending on usage of the corn. Sweet corn will be sampled at the time the corn normally is shipped to market. Silage corn samples will be taken at the time the corn is being processed for silage. Field corn samples will be taken as the corn is being picked.

The ears of corn should accompany each plant in the same bag. They should not be husked. This will be done at the laboratory, if required.

4. Soybeans:

Soybeans used for forage will be sampled as forage. Soybeans grown for seed will be sampled both as whole plants and as seed. For seed, 10 pounds may be obtained from the harvester as it moves over the field, with care that seed from about 20 portions of the field are included in the sample.

Twenty mature plants will be considered a sample. These plants should be taken in the same manner as corn.

5. Rice:

Rice should be sampled at maturity, both as complete plants and as grain. About 10 pounds of mature plants should be taken as a sample on diagonals across the field as in forage, but with the added precaution against tramping and shattering the crop.

It would be better not to obtain the sample than to antagonize the farmer.

The grains of rice may be taken from the combine at various parts of the field to insure it being representative, as in soybeans.

6. Sugarcane:

Sugarcane should be sampled as corn, at time of maturity. Two samples should be taken from the field.

7. Truck crops:

Only the marketable portions of truck crops should be sampled unless the residue is used for cattle feed.

At least 10 pounds of sample should be provided along diagonals across the field with two samples per field. No less than 10 individual vegetables, or the like, will be a sample regardless of weight. In other words, 10 cabbage, or 10 watermelons.

The data sheet should show how many bags represent a sample in such cases. It is conceivable for watermelons that 10 bags will be used. The labels should be marked a, b, c, etc., and a^1, b^1, c^1, etc., for the two samples from the separate diagonals, if more than one bag per sample is required.

8. Nut crops (Pecans):

Ten pounds of mature nuts will represent a sample of the grove, with two samples to be provided from each grove.

Take these as nearly as possible along diagonals across the field. These nuts should be sent to the laboratory in the shell, not hulled.

9. Sweetpotatoes:

Should be sampled as vegetable or truck crop.

10. Samples of milk, farm stored meat, game, fish, or other food products for human consumption will be collected only when results of other monitoring activities indicate need for such. This entire phase

requires special handling. Special sampling instructions will be issued if need arises.

III. Determine impact of agricultural pesticides use on nontarget organisms including (1) beneficial insects, (2) nontarget phytophagous insects, (3) nuisance pests of man and animals, (4) nontarget plant life, and (5) selected organisms which may show biological magnification of residues. Record information on EI T/Form No. 2 where applicable. Submit two copies of form to Regional Office.

A. Light traps: Operate 1 black light trap per area for one night per week. Place trap near center of area. Collect, count, and record Lepidoptera listed below. Preserve remainder of catch in alcohol, label container, and ship to Gulfport taxonomic unit. Place partially completed forms (EI T/F #2) in envelope and tape securely to container. Taxonomic unit will complete form after sorting remainder of collection.

1. Click beetles (Elateridae)
2. *Calosoma* spp. (predatory ground beetles)
3. Blister beetles (Meloidae)
4. Scarab beetles (Scarabaeidae)
5. Spotted cucumber beetle (*Diabrotica undecimpunctata howardi*)
6. Tiger beetles (Cincidellidae)
7. Giant water bug (*Lethocerus americanus*)
8. Southern green stink bug (*Nezara viridula*)
9. Treehoppers (Membracidae)
10. Tomato and tobacco hornworms (*Protoparce* spp.)
11. Salt-marsh caterpillar (*Estigmene acrea*)

B. Sweep net: Take 100 sweeps per block, where habitat is suitable, per week; one sweep covers 180 degrees. Starting at edge of field walk

straight into field. Make counts and record totals of following insects collected.

1. Grasshoppers (Acrididae). Adults and nymphs.
2. Lady beetles (Coccinellidae Beneficial) Adults
3. Bumble bees (Apidae)

C. Soil samples: Take 10 cores per block, once per month, in same blocks selected for pitfall work. Divide cores into 2 samples. Cores will be taken to depth of approximately 1 foot with 5-inch soil auger, or other implement. Sift or shake soil and retrieve invertebrates listed below.

1. White grubs (Scarabaeidae)
2. Wireworms (Elateridae)
3. Earthworms (annelids)

Make and record counts. Freeze specimens and label for submission to laboratory for residue analysis.

D. Pitfall traps: Place 6 wide-mouth ice cream containers in soil to ground level in each selected block. Record location and fill one-third full with 70 percent alcohol. Place traps in afternoon, collect first thing next morning.

Combine collections, make two samples of 3 containers each. Make counts of organisms listed below and record. Make this survey biweekly.

1. Ants (Formicidae)
2. Spiders (Araneida)
3. Ground beetles (Carabidae)
4. Earwigs (Dermaptera)
5. Field crickets (*Acheta* sp.)
6. Rove beetles (Staphalinidae)

E. Nuisance species

1. Mosquitoes: Using dip net make and record counts weekly of larvae for one pond and one stream or ditch (if available) per area. Take 2 samples each consisting of 5 dips at 5 previously selected points.

2. Ticks: Make drag counts in suitable habitat (pasture, fallow, woodland, ditchbank). Each such sample will consist of 10 drags, 100 feet per drag. Take two samples per area weekly and record findings. Count adults and nymphs.

3. House Flies: Make grid counts once per week. Place grid in suitable location near habitation or barn in sunshine. Wait for 1 or 2 minutes until flies are settled. Take count. Place the grid a second time. Take count and average the two counts, and record average on form. Take 2 samples per area.

4. Tabanids: (Horse flies only) Make counts on 10 animals, if available, per area per week. If 10 animals are not present on area, divide available animals into two equal samples. Be sure to use same number in both areas A and B. Using binoculars, walk around animals and count number of horse flies resting on or annoying each animal. Record average per animal.

5. Chiggers: Place black construction paper (8 x 10½) flat on ground in suitable habitat and leave for at least 10 minutes. Make and record counts. Take 2 samples per week per area, 5 exposures per sample.

6. Fleas and mice: This is a three-way project.

   a. Place 10 mouse traps (continuous type) at random in suitable locations. Make 2 samples, 5 traps per sample. Make and record population counts for 2 continuous nights per month, check each morning. Continue until 10 mice are caught.

b. Chloroform a total of 10 mice, 5 per sample, and make flea counts. Comb carcasses, make and record counts (average per animal).

c. Preserve the 10 mice for residue analysis according to instructions. Make two samples.

F. Bees: Two colonies of bees are located in each area. One colony is equipped with a dead bee trap from which samples will be collected. The other colony is equipped with a pollen trap from which pollen samples will be collected.

Instructions will be issued later for making routine collections of pollen, honey, and brood. In the interim, Dr. W. C. Roberts, ENT, will make these collections. It is anticipated that permanent personnel will receive special training and instructions by Dr. Roberts for making these collections at a future date.

Collect and record dead bees daily. Consolidate each daily collection in a deepfreeze for shipment to Gulfport weekly. Record daily mortality on Form No. 2.

The data for Form No. 3 will be required for the accumulated daily mortality for chemical analysis.

When daily mortality exceeds ten times the average, preserve this collection separately in the deepfreeze. Complete Form No. 3 with explanation. Provide any information as to cause of increased mortality such as Block "X" treated with endrin or methyl parathion preceding date, etc.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

G. Biological indication of pesticide drift:

Make observations on nontarget crop areas, pastures, fallow, etc., to establish condition of plants prior to time of application of herbicides or defoliants. After application of herbicides or defoliants, walk through and assess effect. Record effects observed and distance from target area. Collect and submit foliage samples to support observations. Make observations weekly.

H. Indicators of biological magnification of residues:

This work will be in addition to indicators taken from soil samples under C and mice under E-6. Collect indicators, two samples in each area, once per month. Label, freeze immediately, and ship to laboratory according to instructions. Biological specimens for this purpose should be shipped as soon as possible. Indicators will include:

1. Minnows
2. Tadpoles
3. Water turtles
4. Aquatic algae

IV. Weather Data:

A. Place rain guage and Standard U. S. Weather Bureau shelters in each area. Record precipitation daily.

B. Complete weather recording stations with hygrothermographs are expected to arrive for use in each area. In the interim, temperature readings may be obtained from local weather stations.

C. Wind:

Wind guage readings should be taken and recorded whenever treatments are observed in the areas. If spraying is carried on throughout the day, several readings at different time intervals will be made.

CAUTION:

High potency pesticides are being applied in some of the study areas. All employees should guard against hazardous exposure. Follow recommendations in Agricultural Handbook 120 and plan work so these instructions can be followed.

Gulfport, Mississippi

July 2, 1964

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[illegible]

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METHODS OF CHEMICAL ANALYSIS

Condensed procedures used in chemical analysis given in this report are presented on the following pages. It is well to emphasize at this point that pesticide residue analysis is dynamic, constantly changing, as new methods and techniques are developed. The latest and best equipment available has been used in this study. Recent acquisitions include equipment which will permit more rapid and precise analysis of the phosphate insecticides.

Perhaps the greatest development effort is being put forth in the techniques used in clean-up of samples. Some of the methods in use do not provide 100 percent recovery of pesticide residues from the media sampled. Every effort is being made to improve this situation and at the same time permit better separation of the extraneous materials that often accompany the pesticide residues upon extraction.

Cooperative relationship is maintained with Federal, State, and industrial laboratories so that as improved techniques are developed they may be put into use.

The changing methods and techniques bring about another problem; that is, interpretation of old data in light of new. In the present case, many hundreds of the samples were re-examined and new data, if obtained, are included in this report.

The most persistent problems in this residue study centered around interferences. Some of the solvents in use, unless carefully purified and redistilled, give signals on the gas chromatograph which are recorded in the same way as aldrin. There must be constant vigilance, and each batch of solvent must be checked before use. To make matters somewhat more complicated, elemental sulfur, which occurs naturally in many samples, accentuates the aldrin signal so that one may easily be confused into believing the sample is "loaded" with aldrin. Actually this double problem lends itself to solution readily by thin-layer chromatographic clean-up.

Another point of considerable magnitude has been the mutual interference of dieldrin and DDE (a breakdown product of DDT). Here again, thin-layer techniques or column chromatography provide good separation.

One of the problems not recognized until recently in the laboratory was the interference of o,p-DDT (an isomer occurring in the manufacture of DDT) with the analysis of endrin on the gas chromatograph. Thin-layer separation easily solved this interference difficulty, but at the same time caused re-examination of all earlier data. All analyses herein reported have been re-examined in this light.

The presence of an undetermined chlorinated hydrocarbon, suspected to be toxaphene and/or Strobane, at significant levels in numerous soil and silt samples has pointed out the need for study by the analytical staff on the determination of these two insecticides. A technique utilizing thin-

layer technique for separation and colorimetric methods for quantification is being developed and studied. In this preliminary report, however, determinations of toxaphene and/or Strobane are not included.

In order to meet the goals established at the beginning of the program, certain arbitrary limits of definition had to be set. For soils, silt, crops, and biological samples, any chlorinated hydrocarbon residue which is less than 0.1 p.p.m. is recorded as a trace and less than 0.05 is not reported. For water, these limits are a trace if less than 0.1 p.p.b. and less than 0.05 p.p.b. is not reported. The reasons are based on the difficulty in positively identifying any residue below these limits. If the needs of the program in the future determine that these limits should be changed, adjustments will be made.

EQUIPMENT

The following equipment was used in this study:

1. F & M Model 810 gas chromatograph equipped with flame, thermocouple and electron capture detectors.
2. Two Jarrell-Ash Model 28730 gas chromatographs equipped with electron capture detectors.
3. Three Spectronic 20 colorimeters.
4. Two complete thin-layer kits by Brinkman.
5. Perkin-Elmer Model 221 infrared spectrophotometer with KBr pellet press and micro cells.

6. Complete grinding, mixing, and extraction equipment for processing of samples, such as Ohio silage cutter, hammer mill, burr mill, Waring blendors, concentric rotators, U. S. Stoneware ball mills, and the like.

ANALYSIS OF SOIL

Soil for analysis is screened to remove matter such as roots and stones and to insure uniformity of the sample. A subsample of 100 gms. is taken to determine the moisture content. This is heated in an oven at 125°C until there is no further weight loss. The percentage of moisture is then determined.

Then 300 gms. of the soil, based on dry weight, is placed into a 0.5 gallon Mason extraction jar and 600 ml. of 3:1 hexane-isopropanol solvent added. A new cap is placed on the jar and the jar sealed. The sample identification number must be placed on the extraction jar and every other container into which the sample, or portions of the sample, are placed.

The extraction jar is concentrically rotated at 30 r.p.m. for 4 hours. After allowing to stand to permit settling, approximately 200 ml. of extract solution is filtered into a 500 ml. separatory funnel. The solution is washed twice with distilled water. The water washings and any "cuff" remaining at the interface are discarded. The remainder of the washed solution is drawn off into the laboratory sample jar. At this point, each ml. of solvent contains extract from 0.67 gms. of soil.

For a preliminary survey, 5 lambdas (microliters) of solution are injected into gas chromatograph equipped with a 4 ft. glass column containing 5 percent SE 30 on chromosorb W. Temperature of column is maintained at 185°C, the injector port at 220°C, and the electron capture detector at 200°C. Amplification of the instrument is set to provide half scale deflection of the recorder with 5 nanograms of aldrin.

The preliminary survey will complete all samples that are blank; that is, those which do not produce inflection of the disc integrator with the injection used.

In many instances, no further confirmation will be required if a few well defined peaks are present and the retention time exactly fits standards, and there is a history of use of the particular pesticide involved. Such would be the case with lindane, DDT, and heptachlor.

If a peak is present for aldrin and none for dieldrin, then aldrin must be confirmed by further analysis. Confirmation of aldrin is realized through the use of thin-layer technique of Warrington, Schutzmann, and Barthel (1). At this point it is well to call attention to the interference caused by sulfur at aldrin retention time with the column recommended above. (Schutzmann, Ford, and Barthel (2)).

Using the present column, dieldrin and DDE have identical retention times. These two pesticides may be separated according to the Food and Drug

technique, using Florisil column (3), or by thin-layer (1). The Florisil does not lend itself to a large number of samples and is subject to much irregularity due to inactivation of the Florisil by soil constituents. After separation by either method, the eluates are concentrated to known volume and injected into gas chromatograph as before. The peaks can now be positively identified.

ANALYSIS OF WATER

Water is delivered to the sample processing laboratory in 5-gallon bottles. These bottles are weighed and the water decanted into an extraction bottle, using care to not disturb the sediment in the sample bottle unduly. Then the sample bottle is reweighed. Calculation then gives the weight of the water to be extracted. Then 1,000 mls. of 3:1 redistilled pentane-ether solution is added to the extraction bottle. After closure, the extraction bottle is rotated 20 minutes at 30 r.p.m. The hydrocarbon solution is then decanted to a sample flask by syphon arrangement. The solution is concentrated to 10 mls. and a 5 lambdas injection made to determine presence or absence of insecticide, as in the soil analysis.

If insecticides are present, the sample is returned to the laboratory for separation, through thin-layer, of the "drin" family of insecticides from the DDT family. After separation and extraction from the absorbent, the separated concentrates are diluted to known volume and re-examined on the gas chromatograph.

ANALYSIS OF SILT

Silt, sludge, sediment, and the like, which represent soil carried and deposited by water, are analyzed in much the same manner as soil except for the extraction step.

Three hundred gms. of silt, after thorough mixing and following removal of sticks, stones, and plant matter of greater than 10 mm. in diameter, is weighed into the 0.5 gallon Mason extraction jar. To this is added 600 mls. of 3:1 redistilled hexane-isopropanol solution. Then about 150 gms. of anhydrous sulfate is added. The mixture is then rotated

6-A

6-B

7-A

concentrically at 30 r.p.m. for 4 hours.

If it is desired to report analysis on dry weight, a subsample is taken at the same time as the above for moisture determination.

Following the extraction step above, the steps to be followed are the same as those for soil.

PROCEDURES FOR DETERMINATION OF PESTICIDES IN BIOLOGICAL SAMPLES

Honey and Nectar

Weigh 20 gms. of honey into 50 ml. beaker. Transfer into separatory funnel, using 40 ml. redistilled pentane. Shake for 1 minute. Allow to separate, aliquot 20-25 mls. of pentane solution off top. Do not allow any honey solution to get into pipette when drawing off pentane solution. If honey is thick, add 5 to 10 mls. distilled water to thin it for a good mixture. If it is necessary to use water, add a small quantity of sodium sulfate to pentane aliquot to dry sample which is now ready for analysis on gas chromatograph.

When known amounts of insecticides (aldrin, BHC, dieldrin, endrin, and heptachlor) were added to honey, 70 to 80 percent of them were recovered by the above procedure. No interference was observed down to the 0.05 p.p.m. level.

Honey Containing Beeswax

Weigh 2" wide strip of paper. Spot honey from wax on paper. Reweigh to get net weight of sample. Develop paper chromatograph in redistilled

methanol bath and allow solvent front to travel to top of paper. Cut off top 3" of paper and put into centrifuge tube with 10 mls. redistilled pentane. Shake for 1 minute and remove paper. Pentane solution is then ready to inject into gas chromatograph.

Bees

Five gms. of bees are blended in isopropanol for one minute. Transfer to separatory funnel using 200 mls. pentane. Wash twice with distilled water to remove isopropanol. Aliquot 50 mls. of pentane solution and process through Murphy-Corley column as follows:

Add 100 mls. 15% ether to clean column. Add 100 mls. redistilled pentane. Add sample and as solvent approaches dryness, add 200 mls. 6% ether to eluate first fraction. As this solvent approaches dryness, add 200 mls. to eluate second fraction. Evaporate to 10 mls. The samples are then ready for analysis on gas chromatograph.

Soil Invertebrates (white grubs, wireworms, earthworms)

Wash insects externally with acetone by flushing or dipping. Dry under air bath. Weigh sample. Grind in mortar with pestle, using 10 mls. redistilled acetone. Filter into test tube and bring to dryness with 40°C air bath.

Add 10 mls. redistilled pentane and shake well. Allow to settle and decant, leaving any oils or fats that separate.

Do column clean-up, using Murphy-Corley column. Elute consecutively with 200 mls. of 6% and 15% ether in pentane. Evaporate both fractions to 10

mls. Sample is now ready for injection in gas chromatograph.

Algae

Weigh large, fluted filter paper. Filter algae and discard washings. Allow algae on filter paper to air-dry. Trim filter paper around algae. Weigh out 50 grams; freeze balance for possible future use.

Blend the 50 gms. sample in Waring Blender with 250 mls. of redistilled isopropanol for 3 minutes. The mixture is then transferred to 0.5 gallon extraction jar with 750 mls. of redistilled pentane. After careful mixing, the solutions are filtered.

At this point the analysis proceeds exactly as for grass (see below).

Pollen

Grind pollen in mortar with pestle, using 5 mls. per gm. of redistilled isopropanol. Add 5 mls. per gm. redistilled pentane.

From this point on, the procedure is the same as for grass.

Grass

Fifty grams of grass is blended with 250 mls. of isopropanol* and transferred to a half-gallon fruit jar with 750 mls. of pentane. The sample is then concentrically rotated 4 hours on a ferris wheel type rotator.

Forty mls. of the extract from grass, representing 2 grams of original sample, is washed twice with distilled H_2O to remove the alcohol. After removal of the alcohol, the extract is cleaned up on the Murphy-Corley chromatographic column. The Murphy-Corley column is prepared as follows:

a. Add $\frac{1}{4}$ inch Na_2SO_4 to a chromatographic column.

b. Add 10 gms. activated Florisil to the column with gentle tapping.

c. Add 10 gms. of 15:2 Florisil-carbon (Nuchar) to the column with gentle tapping.

d. Add 5 gms. activated Florisil to column with gentle tapping.

e. Add $\frac{1}{2}$ inch Na_2SO_4 to the column.

The column is washed with 100 mls. of 15% ethyl ether in pentane and then with 100 mls. pentane. When the pentane wash solution reaches the top of the Na_2SO_4 layer, the sample extract of 10-20 mls.** is added to the column. (The first fraction is collected from this point). When the level of the 6% ether in pentane reaches the top of the Na_2SO_4 layer, 200 mls. of the 15% ether in pentane is added to the column and collection of the second

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* All solvents must be redistilled.

** The sample extract should be concentrated to 10-20 mls. before the column is prepared.

fraction is begun. After collection of the fractions, each is concentrated to 5 mls. before injection on the GLC column. The 5 mls. containing the sample may be clarified with Nuchar-Attaclay adsorbent if needed.

If it is desired to lower the limits of the p.p.m., the eluant may be concentrated to 1 ml. For several of the commonly used chlorinated hydrocarbon insecticides on grass, this procedure can be used in the range of concentration as low as 10 to 50 parts per billion.

<u>Other Biological Samples</u>

Recognized methods are being followed for extraction and analysis of crop and indicator animal samples such as turtles, minnows and frogs. Improvements in methods of analysis for these types of samples are being developed.

Literature Cited

1. Warrington, J. A., R. L. Schutzmann, and W. F. Barthel. Thin-layer Chromatography as a Supplement to Gas-Liquid Chromatography in the Routine Analysis of Pesticide Residues. Submitted for approval. 1964.

2. Schutzmann, R. L., J. Ford, and W. F. Barthel. Sulfur as an Interfering Substance in Gas-Liquid Chromatography of Pesticide Residues. In preparation. 1964.

3. Barry, H., and J. Hundley. Pesticide Analytical Manual. Methods which Detect more than one Pesticide Residue. July 1963.

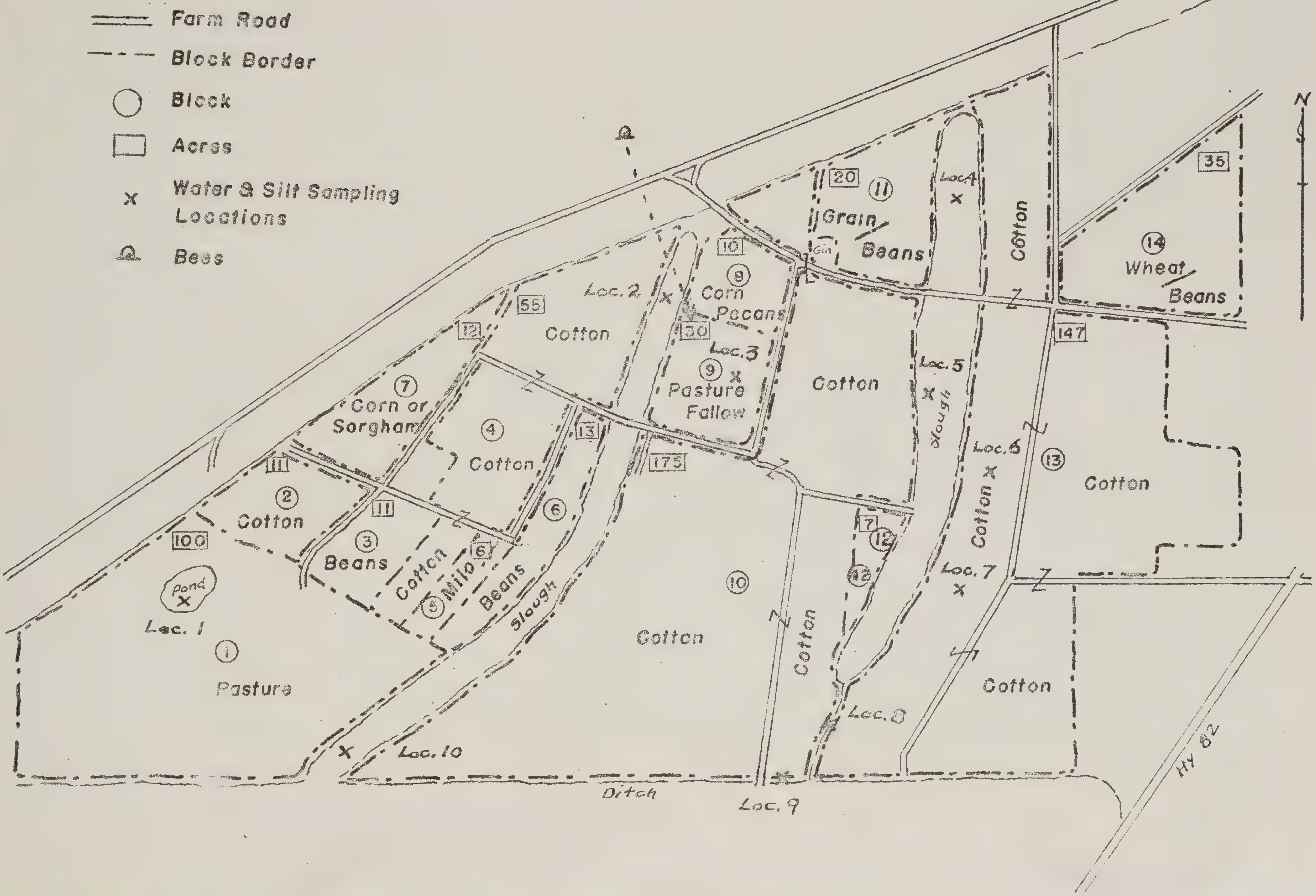
4. Schutzmann, R. L., and W. F. Barthel. Determination of Aldrin and Dieldrin Residues in Soil by Thin-Layer Chromatography. Submitted for approval. 1964.

6-A

6-B

7-A

GRA



Farm Road
Block Border
Block
Acres
Water & Silt Sampling Locations
Bees
N
Pasture
Pond
Loc. 1
Cotton
Beans
Corn or Sorgham
Cotton
Milo
Beans
Slough
Loc. 2
Cotton
Corn
Pecans
Loc. 3
Pasture
Fallow
Grain
Beans
Gin
Loc 4
Cotton
Wheat
Beans
Loc. 5
Slough
Loc. 6
Cotton
Loc. 7
Cotton
Cotton
Cotton
Cotton
Loc. 8
Loc. 9
Ditch
Loc. 10
Hy 82
100
111
11
6
12
55
13
175
10
30
20
35
147
7

LEGEND

Analysis incomplete	- These samples will be re-examined in light of improved techniques.
Arsenic	- All arsenic analyses are reported as metallic arsenic. If no figure is given, it means that arsenic was not run on that particular sample.
N	- Less than 0.05 p.p.b. in water, or less than 0.05 p.p.m. in other samples. If only arsenic analysis is reported, it means that the sample was negative for chlorinated hydrocarbons.
p.p.b.	- Parts per billion.
p.p.m.	- Parts per million.
T	- Trace is less than 0.10 p.p.b. in water, or less than 0.10 p.p.m. in all other samples.

Note: Analysis of phosphates were made only on selected samples.

CHEMICAL TREATMENT HISTORY
Pounds of Technical Material Per Acre

GRA - Blocks Containing Cotton Prior to 1959

Date Applied	Aldrin	BHC	DDT	Dieldrin	Endrin	Methyl Parathion	Malathion	Toxaphene	TEPP	Remarks
1948-1951		0.30	1.00							6-8 Applications
1952		0.30	1.00							5 Applications
	0.25									3 Applications
	0.16									3 Applications
1953		0.30	1.00							3 Applications
	0.25		1.00							3 Applications
	0.16									2 Applications
	0.08									2 Applications
								0.25		1 Application
1954									Unknown	1 Application
		0.30	1.00							5 Applications
				0.15						3 Applications
				0.10						1 Application
				0.05						2 Applications
								2.00		1 Application

CHEMICAL TREATMENT HISTORY
Pounds of Technical Material Per Acre

GRA - Blocks Containing Cotton Prior to 1959 (Continued)

Date Applied	Aldrin	BHC	DDT	Dieldrin	Endrin	Methyl Parathion	Malathion	Toxaphene	TEPP	Remarks
1955		0.30	1.00							6 Applications
				0.15						4 Applications
				0.10						2 Applications
				0.05						2 Applications
1956					0.20		0.50			2 Applications
					0.20					8 Applications
					0.30					3 Applications
1957					0.20		0.50			15 Applications
					0.14		0.50			2 Applications
							0.25			1 Application
1958					0.20	0.25				13 Applications
					0.14	0.16				3 Applications
					0.07	0.08				1 Application

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 1 (100 Acres of pasture and pond)

Date applied	Remarks
1959-1964	None applied.

GRA - Soil Samples

GRA - Block 1

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-79	4.7 Arsenic
6/3	80	3.9 Arsenic
7/1	353	3.9 Arsenic
7/1	354	3.4 Arsenic
7/20	852	2.2 Arsenic
7/20	853	3.1 Arsenic
8/10	1380	4.6 Arsenic
8/10	1381	3.2 Arsenic
9/8	2073	N
9/8	2075	T Methyl Parathion

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[illegible]	[illegible]	[illegible]
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	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

BIOLOGICAL RECORD

SWEEP NET

BLOCK 1-PASTURE

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 2	July 9	July 13	July 23	July 30	Aug. 5
Grasshoppers	3	0	62	3	3	57	4	2
Lady beetles	0	3	1	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 14	Sept. 21	Oct. 5
Grasshoppers	2	0	0	1	3	3	0	3
Lady beetles	0	0	0	0	0	1	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRA

6-R 7-A

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 1-PASTURE

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly											
	July 18*		July 21		Aug. 19		Sept. 1		Sept. 16		Sept. 27	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		10	6	0	0	0	3	5	0	2	0
Spiders	3		0	2	0	1	1	1	0	0	2	3
Ground beetles	2		0	2	0	0	0	0	0	0	0	0
Earwigs	0		0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	1	0	1	0	0
Field crickets	1		2	1	2	3	0	0	0	0	0	2

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 1-PASTURE

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	July 9		July 16		Aug. 19		Sept. 24	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	1	0	0	0	0	0	0	0
Wireworms	1	0	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 2 (11 Acres of cotton)

Date applied	Anhydrous Ammonia	Carbaryl	DDT	Endrin	Methyl Parathion	Toxaphene	Merphos	Remarks
1960					0.08			1 Application.
				0.14	0.16			2 Applications.
				0.2	0.25			7 Applications.
1961					0.08			2 Applications.
				0.14	0.16			1 Application
				0.2	0.25			11 Applications.
1962				0.07	0.08			1 Application.
				0.14	0.16			3 Applications.
				0.2	0.25			8 Applications.
1963					0.08	1.0		1 Application.
				0.14	0.16			2 Applications.
				0.2	0.25			10 Applications.
				0.3				1 Application.
				0.3	0.4			2 Applications.
				0.4	0.5			1 Application.
1964								
5/18	100.0				0.166	1.0		
5/25					0.166	1.0		
6/4				0.25	0.2			
6/18			0.6		0.8			
7/23				0.2	0.25			
8/6				0.32	0.32			
8/19				0.32	0.32			
8/27				0.32	0.32			
9/3				0.32	0.32			
9/9				0.32	0.32			
9/18				0.32	0.32			
9/18							0.375	

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GRA - Soil Samples

GRA - Block 2

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-81	T Lindane 1.62 p,p DDT 0.19 o,p DDT 0.2 DDE 3.0 Arsenic
6/2	82	1.2 p,p DDT 0.25 DDE 2.7 Arsenic
6/26	355	2.2 p,p DDT 0.81 o,p DDT 0.29 DDE 4.1 Arsenic
6/26	356	2.09 p,p DDT 0.41 o,p DDT 0.27 DDE 4.6 Arsenic
7/15	634	0.74 p,p DDT 0.4 o,p DDT 0.2 DDE 5.6 Arsenic
7/15	635	0.87 p,p DDT 0.47 o,p DDT 0.25 DDE 3.3 Arsenic
8/10	1382	0.61 p,p DDT 0.37 o,p DDT 0.18 DDE 0.21 Endrin 4.7 Arsenic
		4.7 Arsenic
8/10	1383	1.54 p,p DDT 0.66 o,p DDT 0.22 DDE 7.0 Arsenic

GRA - Soil Samples

GRA - Block 2 (Cont'd.)

Date sampled 1964	Log number	Pesticides found ppm
9/8	G4-2076	0.64 p,p DDT T Dieldrin 0.3 Endrin
9/8	2079	0.75 p,p DDT 0.46 o,p DDT 0.18 DDE 0.04 Methyl Parathion

BIOLOGICAL RECORD

SWEEP NET

BLOCK 2-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week						
	June 20	June 25	July 2	July 6	July 13	July 30	Aug. 5
Grasshoppers	0	0	1	0	0	0	0
Lady beetles	0	0	0	0	1	0	0
Bumble bees	0	0	0	0	0	0	0

	Aug. 13	Aug. 21	Aug. 25	Aug. 31	Sept. 7	Sept. 15*	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*Field disced-only stubbles left

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 3 (11 Acres of soybeans)

Date applied	Carbaryl	Endrin	Methyl Parathion	Remarks
1960			0.08	1 Application.
		0.14	0.16	2 Applications.
		0.2	0.25	7 Applications.
1961			0.08	2 Applications.
		0.14	0.16	1 Application.
		0.2	0.25	11 Applications.
1962-1963				None applied.
1964				
9/18	1.5			

GRA - Soil Samples

GRA - Block 3

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-83	T Lindane 1.48 p,p DDT 0.2 o,p DDT 0.59 DDE 5.4 Arsenic
6/2	84	1.17 p,p DDT 0.19 o,p DDT 0.27 DDE 2.9 Arsenic
6/26	357	0.84 p,p DDT 0.19 o,p DDT 5.7 Arsenic
6/26	358	0.72 p,p DDT 0.19 DDE 2.6 Arsenic
7/15	636	0.27 p,p DDT 0.12 o,p DDT 0.11 DDE 5.1 Arsenic
7/15	637	0.25 p,p DDT 0.15 o,p DDT 0.12 DDE 4.6 Arsenic
8/29	1921	1.0 p,p DDT 0.7 o,p DDT 0.2 DDE T Dieldrin T Endrin
8/29	1922	T Lindane 0.3 p,p DDT 0.9 o,p DDT 0.3 DDE 0.12 Dieldrin T Endrin 0.03 Methyl Parathion

GRA - Soil Samples

GRA - Block 3 (Cont'd.)

Date sampled 1964	Log number	Pesticides found ppm
9/23	G4-2451	0.63 p,p DDT 0.4 o,p DDT 0.2 DDE 0.26 Endrin
9/23	2456	0.83 p,p DDT 0.46 o,p DDT 0.31 DDE 0.22 Endrin
10/6	2623	0.87 p,p DDT 0.6 o,p DDT 0.35 DDE T Dieldrin
10/8	2626	0.73 p,p DDT 0.4 o,p DDT 0.28 DDE T Dieldrin

BIOLOGICAL RECORD

SWEEP NET

BLOCK 3-SOYBEANS

	Totals Per 100 Sweeps-One Collection Per Week						
Indicator Species	June 20	July 2	July 9	July 13	July 23	July 30	Aug. 5
Grasshoppers	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0

	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 14	Sept. 22	Oct. 5
Grasshoppers	0	0	0	1	0	0	0	0
Lady beetles	0	0	0	1	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 4 (55 Acres of cotton)

Date applied	Anhydrous Ammonia	Calcium Cyanamide	DDT	Diuron	Endrin	Methyl Parathion	Toxaphene	Remarks
1960						0.08		1 Application.
					0.14	0.16		2 Applications.
					0.2	0.25		7 Applications.
1961						0.08		2 Applications.
					0.14	0.16		1 Application.
					0.2	0.25		11 Applications.
1962					0.07	0.08		1 Application.
					0.14	0.16		3 Applications.
					0.2	0.25		8 Applications.
1963						0.08	1.0	1 Application.
					0.14	0.16		2 Applications.
					0.2	0.25		10 Applications.
					0.3			1 Application.
					0.3	0.4		2 Applications.
					0.4	0.5		1 Application.
1964								
5/18	100.0					0.166	1.0	
5/25						0.166	1.0	
6/13			0.6			0.8		
6/18			0.6			0.8		
7/21				0.8				
7/23					0.2	0.25		
8/13					0.32	0.32		
8/19					0.32	0.32		
8/24					0.32	0.32		Rained after treatment.
8/24					0.32	0.32		Re-treated same day.
8/27					0.32	0.32		
9/3					0.32	0.32		
9/9					0.32	0.32		
10/8		17.0						

GRA - Soil Samples

GRA - Block 4

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-85	1.34 p,p DDT 0.19 o,p DDT 0.24 DDE 4.9 Arsenic
6/2	86	0.74 p,p DDT 0.27 o,p DDT 0.26 DDE T Dieldrin T Endrin 0.15 TDE 3.2 Arsenic
6/23	284	0.76 p,p DDT 0.32 o,p DDT 0.25 DDE 3.1 Arsenic
6/23	285	0.66 p,p DDT 0.32 o,p DDT 0.21 DDE 2.8 Arsenic
8/3	1090	T Lindane 0.99 p,p DDT 0.45 o,p DDT 0.35 DDE T Dieldrin T Endrin 3.6 Arsenic
8/3	1091	0.29 p,p DDT 0.12 o,p DDT 0.54 DDE 5.3 Arsenic
8/24	1747	1.19 p,p DDT 0.19 DDE T Endrin
8/24	1748	1.57 p,p DDT 0.71 DDE 0.24 Dieldrin T Endrin
9/21	2454	0.89 p,p DDT 0.49 o,p DDT 0.29 DDE 0.4 Endrin

6-B

7-A

BIOLOGICAL RECORD

SWEEP NET

BLOCK 4-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 2	July 6	July 16*	July 23*	July 30	Aug. 5
Grasshoppers	1	0	0	0			0	0
Lady beetles	0	0	0	0			1	1
Bumble bees	0	0	0	0			0	0
	Aug. 13	Aug. 21	Aug. 25	Aug. 31	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*No samples taken during week.

GRA

6-B 7-A

[illegible]

[illegible]

[illegible]

[illegible]

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 4-COTTON

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly													
	June 19*		July 21**		July 28		Aug. 22		Sept. 1		Sept. 14		Sept. 27	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0				0	0	1	0	0	0	0	0	0	0
Spiders	0				0	0	0	0	0	0	0	3	0	1
Ground beetles	3				4	0	1	4	0	0	1	0	0	0
Earwigs	0				0	0	0	0	0	0	0	0	0	0
Rove beetles	0				0	0	0	0	0	0	0	1	0	0
Field crickets	0				0	0	0	0	0	0	0	0	2	0

*Only one sample taken.
**No sample taken because of layby herbicide at request of owner.

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 4-COTTON

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly					
	July 7		Aug. 31		Sept. 19	
	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 5 (6 Acres of milo)

Date applied	Remarks
1959-1964	None applied.

GRA - Soil Samples

GRA - Block 5

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-87	T Lindane 0.4 p,p DDT 0.17 DDE 4.3 Arsenic
6/2	88	T Aldrin T Lindane 0.22 p,p DDT T o,p DDT 0.12 DDE T TDE 4.2 Arsenic
6/27	361	0.27 p,p DDT 4.7 Arsenic
6/27	362	0.21 p,p DDT 4.5 Arsenic
7/28	972	0.27 p,p DDT 0.11 o,p DDT 0.14 DDE T Dieldrin 7.2 Arsenic
7/28	973	0.63 p,p DDT 0.39 o,p DDT 0.29 DDE T Dieldrin 5.0 Arsenic
8/20	1597	0.06 Dieldrin
8/20	1598	0.34 p,p DDT 0.15 o,p DDT 0.12 DDE
9/14	2264	1.3 p,p DDT 0.51 o,p DDT 0.39 DDE 0.14 Dieldrin T Endrin
9/14	2265	0.23 p,p DDT T o,p DDT T DDE

BIOLOGICAL RECORD

SWEEP NET

BLOCK 5-MILO

Indicator Samples	Totals Per 100 Sweeps-One Collection Per Week							
	June 20	June 25	July 2	July 9	July 13	July 23	July 30	Aug. 5
Grasshoppers	0	3	0	0	0	3	0	0
Lady beetles	0	5	5	1	1	1	0	0
Bumble bees	0	0	0	0	0	0	0	1
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 14	Sept. 22*	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	3	0	0	1	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*This block disced up.

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 6 (13 Acres of soybeans)

Date applied	Carbaryl	Remarks
1959-1963		None applied.
1964 9/18	1.5	

[illegible]
[illegible]

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GRA - Soil Samples

GRA - Block 6

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-89	2.7 Arsenic
6/3	90	1.6 Arsenic
6/23	286	4.9 Arsenic
6/23	287	4.2 Arsenic
7/28	974	3.9 Arsenic
7/28	975	2.6 Arsenic
8/31	1926	N
8/31	1927	N
10/8	2622	N
10/8	2625	0.14 p,p DDT T o,p DDT T DDE

BIOLOGICAL RECORD

SWEEP NET

BLOCK 6-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 20	June 25	July 2	July 9	July 13	July 23	July 30	Aug. 5
Grasshoppers	0	0	0	0	2	1	0	1
Lady beetles	0	0	0	0	0	1	0	1
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	2	2	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 7 (12 Acres of milo)

Date applied	Remarks
1959-1964	None applied.

GRA - Soil Samples

GRA - Block 7

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-91	0.73 p,p DDT 0.17 DDE 4.6 Arsenic
6/3	92	0.48 p,p DDT 0.1 DDE 4.8 Arsenic
6/24	288	0.27 p,p DDT 0.13 DDE 4.2 Arsenic
6/24	289	0.27 p,p DDT 0.17 DDE 5.4 Arsenic
7/15	638	T Lindane 0.3 p,p DDT T o,p DDT 0.18 DDE 4.9 Arsenic
7/15	639	T Lindane 0.31 p,p DDT 0.11 o,p DDT 0.15 DDE T Dieldrin 5.2 Arsenic
8/20	1599	T Lindane 1.6 p,p DDT T o,p DDT 0.63 DDE
8/20	1600	N
9/14	2266	1.0 p,p DDT 0.2 o,p DDT T DDE 0.1 Dieldrin
9/14	2270	T Lindane 0.46 p,p DDT T o,p DDT 0.27 DDE

BIOLOGICAL RECORDS

SWEEP NET

BLOCK 7-MILO

	Totals Per 100 Sweeps-One Collection Per Week							
Indicator Species	June 20	June 25	July 2	July 6	July 13	July 23	July 30	Aug. 5
Grasshoppers	0	1	3	0	1	0	0	0
Lady beetles	0	2	9	10	3	11	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15*	Sept.	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*This block disced up

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 8 (10 Acres of corn)

Date applied	Endrin	Methyl Parathion	Remarks
1959-1963			None applied.
1964 6/17	0.2	0.25	

GRA - Soil Samples

GRA - Block 8

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-93	0.2 p,p DDT 0.13 DDE 3.4 Arsenic
6/3	94	0.18 p,p DDT T DDE 2.4 Arsenic
6/23	290	3.7 Arsenic
6/23	291	0.33 p,p DDT 0.15 DDE 2.8 Arsenic
7/15	640	T p,p DDT T o,p DDT 0.2 DDE T Dieldrin 0.12 Endrin 2.3 Arsenic
7/15	641	0.21 p,p DDT 0.18 o,p DDT 0.51 DDE 0.1 Dieldrin 3.7 Arsenic
8/10	1384	0.61 p,p DDT 0.32 o,p DDT 0.25 DDE 0.26 Dieldrin 0.12 Endrin 4.0 Arsenic
8/10	1385	4.6 Arsenic Analysis incomplete
9/8	2085	0.32 p,p DDT 0.16 o,p DDT 0.14 DDE 0.1 Dieldrin

BIOLOGICAL RECORD

SWEEP NET

BLOCK 8-CORN (PECANS)

	Totals Per 100 Sweeps-One Collection Per Week							
Indicator Species	June 18	June 25	July 2	July 6	July 13	July 21	July 30	Aug. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	4	5	0	3	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15	Sept. 22*	Sept. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*This block disced up; only stubbles left.

GRA

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 8-CORN AND PECANS

	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly											
Indicator Species	June 18*		July 14		Aug. 11		Aug. 25		Sept. 9		Sept. 16	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0	0	0	0	1	0	3	2	2	5
Spiders	1		4	0	0	0	0	0	0	0	0	0
Ground beetles	0		0	0	2	1	0	0	0	3	0	1
Earwigs	0		0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	1	0	0	0	0
Field crickets	0		0	0	2	4	0	0	1	1	0	0

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 8-CORN AND PECANS

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	June 29		July 15		Aug. 13		Sept. 11	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	1	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	2	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 9 (30 Acres of pasture and fallow)

Date applied	Dioxathion	Remarks
1959-1963		None applied.
1964		
7/23	0.5/50 gals. water	Sprayed on 20 head of cattle confined in barn lot. Approximately 2½ gallons of solution per animal.
9/8	0.5/50 gals. water	Sprayed on 20 head of cattle confined in barn lot. Approximately 2½ gallons of solution per animal.

GRA - Soil Samples

GRA - Block 9

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-95	1.3 Arsenic
6/3	96	2.1 Arsenic
6/23	292	1.0 Arsenic
6/23	293	2.0 Arsenic
7/23	854	0.7 Arsenic
7/23	855	2.0 Arsenic
8/19	1601	N
8/19	1602	N
9/14	2267	N
9/14	2268	N

BIOLOGICAL RECORD

SWEEP NET

BLOCK 9-PASTURE (FALLOW)

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 20	June 25	July 2	July 6	July 13	July 21	July 30	Aug. 5
Grasshoppers	1	2	1	1	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15*	Sept. 22	Oct. 5
Grasshoppers	0	2	2	1	1	0	0	1
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*Block disced up

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 10 (175 Acres of cotton)

Date applied	Anhydrous Ammonia	Calcium Cyanamide	DDT	Diuron	Endrin	Methyl Parathion	Toxaphene	Merphos	Remarks
1960						0.08			1 Application.
					0.14	0.16			2 Applications.
					0.2	0.25			7 Applications.
1961						0.08			2 Applications
					0.14	0.16			1 Application
					0.2	0.25			11 Applications.
1962					0.07	0.08			1 Application.
					0.14	0.16			3 Applications.
					0.2	0.25			8 Applications.
1963						0.08	1.0		1 Application.
					0.14	0.16			2 Applications.
					0.2	0.25			10 Applications.
					0.3				1 Application
					0.3	0.4			2 Applications
					0.4	0.5			1 Application
1964									
5/18	100.0					0.166	1.0		
5/25						0.166	1.0		
6/9			0.6			0.8			
6/20			0.6			0.8			150 A. treated.
7/16				0.8					150 A. treated.
7/17					0.2	0.25			150 A. treated.
8/13					0.32	0.32			
8/19					0.32	0.32			
8/26					0.32	0.32			
8/27					0.32	0.32			
9/3					0.32	0.32			
9/9					0.32	0.32			
9/19								1.0	
10/8		17.0							

GRA - Soil Samples

GRA - Block 10

Date sampled 1964	Log number	Pesticides found ppm
6/4	G4-97	1.99 p,p DDT 0.37 o,p DDT 0.25 DDE 5.5 Arsenic
6/4	98	1.18 p,p DDT 0.26 o,p DDT 0.16 DDE 3.8 Arsenic
6/24	294	1.24 p,p DDT 0.48 o,p DDT 0.29 DDE 5.1 Arsenic
6/24	295	2.1 p,p DDT 0.45 o,p DDT 0.25 DDE 4.4 Arsenic
8/3	1086	1.16 p,p DDT 0.61 o,p DDT 0.31 DDE 4.4 Arsenic
8/3	1087	5.8 Arsenic Analysis incomplete
8/24	1749	T Lindane 1.21 p,p DDT 0.35 DDE T Dieldrin T Endrin
8/24	1750	0.65 p,p DDT 0.45 o,p DDT 0.18 DDE ~~1~~.04 Methyl Parathion ?
9/24	2457	T Lindane 0.8 p,p DDT T Dieldrin
9/24	2458	0.4 p,p DDT

BIOLOGICAL RECORD

SWEEP NET

BLOCK 10-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 2	July 6	July 16*	July 21*	July 30	Aug. 5
Grasshoppers	0	0	0	0			0	0
Lady beetles	0	0	0	0			0	0
Bumble bees	0	0	0	1			0	0
	Aug. 13	Aug. 21	Aug. 25	Aug. 31	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*No samples taken during week

GRA

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 10-COTTON

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly													
	June 18*		July 24**		Aug. 4		Aug. 22		Sept. 1		Sept. 14		Sept. 27	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0				0	0	0	0	2	0	0	0	0	0
Spiders	0				0	0	0	0	0	0	0	1	0	0
Ground beetles	2				1	2	1	1	0	4	0	0	0	0
Earwigs	0				0	0	0	0	0	0	0	0	0	0
Rove beetles	0				0	0	0	0	0	0	0	0	0	0
Field crickets	0				0	1	0	0	0	0	1	0	1	0

*Only one sample taken.
**No sample taken because of layby herbicide at request of owner.

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 10-COTTON

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly					
	July 7		Aug. 24		Sept. 19	
	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 11 (20 Acres of soybeans)

Date applied	Carbaryl	Remarks
1960-1963		None applied.
1964		
9/18	1.5	

GRA - Soil Samples

GRA - Block 11

Date sampled 1964	Log number	Pesticides found ppm
6/4	G4-99	3.8 Arsenic
6/4	100	4.1 Arsenic
6/29	363	4.6 Arsenic
6/29	364	4.6 Arsenic
7/29	976	0.68 p,p DDT 5.3 Arsenic
7/29	977	0.16 p,p DDT 4.9 Arsenic
8/31	1923	0.3 p,p DDT T Endrin
8/31	1924	0.5 p,p DDT 0.35 o,p DDT 0.11 DDE
10/8	2620	0.26 p,p DDT 0.18 o,p DDT T DDE T Endrin
10/8	2624	N

6-B

7-A

BIOLOGICAL RECORD

SWEEP NET

BLOCK 11-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 25	July 2	July 9	July 13	July 21	July 30	Aug. 5	Aug. 13
Grasshoppers	1	1	0	0	0	2	1	0
Lady beetles	0	0	0	0	0	0	0	3
Bumble bees	0	0	0	0	0	0	0	0

	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0
Lady beetles	2	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0

GRA

7-A 6-B

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 12 (7 Acres of soybeans)

Date applied	Carbaryl	Endrin	Methyl Parathion	Remarks
1960			0.08	1 Application.
		0.14	0.16	2 Applications.
		0.2	0.25	7 Applications.
1961			0.08	2 Applications.
		0.14	0.16	1 Application.
		0.2	0.25	11 Applications.
1962-1963				None applied.
1964				
9/19	1.5			

GRA - Soil Samples

GRA - Block 12

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-101	1.6 p,p DDT 0.38 o,p DDT 0.17 DDE 6.3 Arsenic
6/3	102	1.7 p,p DDT 0.3 o,p DDT 0.21 DDE 6.1 Arsenic
6/27	359	1.63 p,p DDT 0.22 DDE 6.4 Arsenic
6/27	360	1.56 p,p DDT 0.17 DDE 6.9 Arsenic
7/23	856	T Lindane 0.92 p,p DDT 0.4 o,p DDT 0.28 DDE 0.19 Dieldrin 0.29 Endrin 8.6 Arsenic
7/23	857	0.66 p,p DDT 0.4 o,p DDT 0.2 DDE 3.6 Arsenic
8/13	1386	0.62 p,p DDT 0.23 o,p DDT 0.21 DDE T Dieldrin 12.5 Arsenic
8/13	1387	0.43 p,p DDT 0.37 o,p DDT 0.16 DDE 4.9 Arsenic
9/8	2074	0.11 Dieldrin
9/8	2078	0.6 p,p DDT T Dieldrin

BIOLOGICAL RECORD

SWEEP NET

BLOCK 12-SOYBEANS

	Totals Per 100 Sweeps-One Collection Per Week							
Indicator Species	June 20	June 25	July 2	July 6	July 13	July 21	July 30	Aug. 5
Grasshoppers	0	0	2	1	0	1	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 13	Aug. 20	Aug. 25	Sept. 2	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	1	0	1	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRA

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 13 (147 Acres of cotton)

Date applied	BHC	DDT	Endrin	Methyl Parathion	Toxaphene	Remarks
1959					0.5	2 Applications.
					1.0	2 Applications.
					2.0	3 Applications.
		1.0			2.5	2 Applications.
	0.3	1.0				6 Applications.
1960				0.08		1 Application.
			0.14	0.16		2 Applications.
			0.2	0.25		7 Applications
1961				0.08		2 Applications.
			0.14	0.16		1 Application.
			0.2	0.25		11 Applications.
1962			0.07	0.08		1 Application.
			0.14	0.16		3 Applications.
			0.2	0.25		8 Applications.
1963				0.08	1.0	1 Application.
			0.14	0.16		2 Applications.
			0.2	0.25		10 Applications.
			0.3			1 Application.
			0.3	0.4		2 Applications.
			0.4	0.5		1 Application.

See next page for treatments applied in 1964.

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 13 (147 Acres of cotton)

Date applied	Anhydrous Ammonia	Carbo-phenothion	DDT	Diuron	Endrin	Merphos	Methyl Parathion	Toxaphene	Remarks
1964									
5/18	100.0						0.166	1.0	
5/25							0.166	1.0	
6/8			0.6				0.8		
6/17			0.6				0.8		
7/17				0.8					
7/21					0.2		0.25		
7/25		0.5			0.2		0.25		8 A. treated for red spider.
8/6					0.32		0.32		
8/19					0.32		0.32		
8/20		0.5							8 A. treated for red spider.
8/27					0.32		0.32		
9/3					0.32		0.32		
9/9					0.32		0.32		
9/10						0.66			Applied to 65 A.
9/19						0.75			Applied to 65 A.
9/19						1.0			Applied to 82 A.

GRA - Soil Samples

GRA - Block 13

Date sampled 1964	Log number	Pesticides found ppm
6/4	G4-103	2.6 p,p DDT 0.43 o,p DDT 0.25 DDE 3.7 Arsenic
6/4	104	1.9 p,p DDT 0.33 o,p DDT 0.33 DDE 3.8 Arsenic
6/24	296	0.69 Lindane 1.59 p,p DDT 0.2 o,p DDT 0.26 DDE 3.2 Arsenic
6/24	297	2.81 p,p DDT 0.95 o,p DDT 0.37 DDE T Dieldrin T Endrin 4.8 Arsenic
8/3	1088	0.93 p,p DDT 0.65 o,p DDT 0.26 DDE T Dieldrin 0.23 Endrin 4.9 Arsenic
8/3	1089	1.01 p,p DDT 0.35 o,p DDT 0.35 DDE T Dieldrin 0.29 Endrin 4.2 Arsenic
8/24	1751	3.36 p,p DDT T o,p DDT 0.93 DDE
9/21	2452	0.6 p,p DDT T Dieldrin
9/21	2455	0.7 p,p DDT 0.12 Dieldrin 0.27 Endrin

[illegible]

[illegible]

BIOLOGICAL RECORD

SWEEP NET

BLOCK 13-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 2	July 6	July 16*	July 21*	July 30	Aug. 5
Grasshoppers	0	0	1	0			0	0
Lady beetles	0	1	0	0			0	0
Bumble bees	0	0	0	0			0	0
	Aug. 13	Aug. 21	Aug. 25	Aug. 31	Sept. 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

*No samples taken

GRA

6-B 7-A

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRA - Block 14 (35 Acres of soybeans)

Date applied	BHC	Carbaryl	DDT	Endrin	Methyl Parathion	Toxaphene	Remarks
1959						0.5	2 Applications.
						1.0	2 Applications.
						2.0	3 Applications.
			1.0			2.5	2 Applications.
	0.3		1.0				6 Applications.
1960					0.08		1 Application.
				0.14	0.16		2 Applications.
				0.2	0.25		7 Applications.
1962				0.07	0.08		1 Application.
				0.14	0.16		3 Applications.
				0.2	0.25		8 Applications.
1964 9/19		1.5					

GRA - Soil Samples

GRA - Block 14

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-105	0.33 p,p DDT
		T DDE
		4.4 Arsenic
6/3	106	0.69 p,p DDT
		0.27 o,p DDT
		0.32 DDE
		4.0 Arsenic
6/23	298	0.41 p,p DDT
		0.17 DDE
		4.7 Arsenic
6/23	299	3.6 Arsenic
		Analysis incomplete
7/29	978	0.64 p,p DDT
		0.25 o,p DDT
		0.31 DDE
		5.0 Arsenic
7/29	979	1.7 p,p DDT
		1.0 o,p DDT
		0.59 DDE
		5.1 Arsenic
8/31	1920	1.7 p,p DDT
		0.4 o,p DDT
		T DDE
8/31	1925	0.9 p,p DDT
		0.1 DDE
		T Dieldrin
		T Endrin

BIOLOGICAL RECORD

SWEEP NET

BLOCK 14-SOYBEANS

	Totals Per 100 Sweeps-One Collection Per Week						
Indicator Species	June 25	July 2	July 9	July 21	July 30	Aug. 5	Aug. 13
Grasshoppers	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0
	Aug. 20	Aug. 25	Sept. 2	Sept 7	Sept. 15	Sept. 22	Oct. 5
Grasshoppers	0	0	0	0	0	0	0
Lady beetles	0	0	2	0	0	0	0
Bumble bees	0	0	0	0	0	0	0

GRA

7-A 6-B

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 14-SOYBEANS

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly													
	June 19*		July 14		July 24		Aug. 11		Aug. 25		Sept. 9		Sept. 16	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0	0	0	0	0	0	0	1	0	1	0	0
Spiders	0		0	0	0	0	0	0	0	0	0	0	0	0
Ground beetles	0		1	0	4	1	2	6	0	1	5	5	0	14
Earwigs	0		0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	0	0	0	0	0	0	0
Field crickets	0		0	0	0	0	1	3	0	0	0	3	0	3

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 14-SOYBEANS

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	July 8		July 16		Aug. 13		Sept. 11	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

GRA - Water And Silt Samples[1/]

A - Well water
B - Water leaving the study area
C - Water running off the fields
D - Water draining onto the area from outside
E - Water flowing off fields immediately after rain

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
C Water	1	6/9	G4-221	N	
C Silt	1	6/9	248		N
C Water	2	6/9	222	N	
C Silt	2	6/9	249		N
A Water	3-6	6/9	223	N	
C Water	9	6/9	224	0.39 Lindane	
C Silt	9	6/9	250		0.36 p,p DDT 0.3 o,p DDT
C Water	4	6/9	225	N	
C Water	5	6/9	226	N	
C Silt	5	6/9	251		0.25 Lindane 0.14 p,p DDT 0.79 o,p DDT 0.39 DDE 0.13 Heptachlor
C Water	1	7/1	347	N	
C Silt	1	7/1	440		N
C Water	2	7/1	348	N	
C Silt	2	7/1	441		N
C Water	5	7/1	349	N	
C Silt	5	7/1	442		0.25 o,p DDT 0.36 DDE
C Water	4	7/1	350	N	
B Silt	10	7/11	567		N
B Water	10	7/11	582	N	
A Water	3,6,7	7/11	583	N	
C Water	1	7/17	845	N	
C Silt	1	7/17	920		N
C Water	2	7/17	846	N	
C Silt	2	7/17	921		N

1/ Classifications B, C, D, and E also apply to silt.

6-B
7-A

GRA - Water And Silt Samples (Cont'd.)

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
C Water	4	7/23	G4-847	N	
C Water	8	7/23	848	N	
C Silt	8	7/23	922		0.08 Lindane
					0.32 o,p DDT
					0.1 DDE
					0.06 Heptachlor
C Silt	8	7/23	923		0.09 p,p DDT
					0.51 o,p DDT
					0.31 DDE
A Water	3,6,7	7/27	958	N	
C Water	9	7/28	959	N	
C Silt	9	7/28	1040		T p,p DDT
					0.3 o,p DDT
					0.15 DDE
C Silt	5	8/10	1355		0.25 o,p DDT
					0.15 DDE
					T Endrin
C Water	5	8/10	1480	N	
B Silt	10	8/8	1356		T Dieldrin
B Water	10	8/8	1481	N	
C Water	4	8/11	1479	N	
C Water	1	8/14	1520	N	
C Silt	1	8/14	1529		N
C Silt	5	8/17	1543		0.61 o,p DDT
					0.2 DDE
					T Dieldrin
C Silt	9	8/17	1544		T Lindane
					0.32 p,p DDT
					0.93 o,p DDT
					0.29 DDE
					0.16 Dieldrin
					0.11 Endrin
E Silt - Runoff from blocks 13-14		8/17	1545		0.23 p,p DDT
					0.36 DDE
					0.2 Dieldrin

GRA - Water And Silt Samples (Cont'd.)

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
C Water	1	8/19	G4-1627	N	
E Water	Blks. 2,3,4,7	8/17	1628	N	
A Water	3,6,7	8/17	1629	N	
C Silt	2	8/26	1800		N
B Silt	10	8/26	1801		0.18 o,p DDT T DDE
C Silt	1	9/10	2115		N
C Water	1	9/10	2157	N	
C Silt	8	9/4	2127		T p,p DDT 0.43 o,p DDT 0.12 DDE
C Water	4	9/10	2151	N	
C Silt	5	9/10	2124		0.36 o,p DDT 0.11 DDE
C Water	5	9/10	2156	N	
C Silt	9	9/16	2237		T p,p DDT 0.45 o,p DDT 0.17 DDE 0.32 Endrin
A Water	3,6,7	9/18	2396	N	
C Water	2	9/23	2398	N	
C Silt	2	9/23	2429		N
C Silt	8	10/3	2642		N
B Silt	10	9/23	2427		0.05 Lindane 0.15 p,p DDT 0.38 o,p DDT 0.24 DDE T Dieldrin 0.23 Endrin

<u>GRA - Apiary Samples</u>

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	7/10	G4-728	T p,p DDE 0.18 o,p DDE
Bees	7/15	729	1.52 p,p DDT 0.38 o,p DDT 0.26 p,p DDE 0.26 o,p DDE 0.15 Dieldrin 0.18 Endrin
Bees	7/3	775	0.39 p,p DDT 0.23 o,p DDT 0.2 p,p DDE 0.19 o,p DDE 0.27 Dieldrin T Heptachlor
Nectar - Hive 6	7/3	781	N
Pollen - Hive 6 Vial 1	7/4	806	N
Corn Pollen - Hive 6 Vial 1	7/12	809	N
Honey - Hive 6	8/3	1158	N
Honey - Hive 6	8/3	1168	N
Honey - Hive 62	8/3	1169	N
Honey - Hive 62	8/3	1171	N
Nectar - Hive 6	8/4	1186	N
Nectar - Hive 6	8/4	1187	N
Nectar	7/21	1188	N
Nectar	7/21	1189	N
Pollen - Vial 1	8/4	1216	N

GRA - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	7/22	G4-1223	0.23 Aldrin
			0.1 Lindane
			0.39 p,p DDT
			0.23 o,p DDT
			0.33 p,p DDE
			0.16 Dieldrin
			0.18 Heptachlor
Bees	7/27-31	1224	0.33 p,p DDT
			0.15 o,p DDT
			0.15 p,p DDE
			0.22 o,p DDE
Bees	7/20-24	1227	0.15 Lindane
			0.19 p,p DDT
			0.14 o,p DDT
			0.16 p,p DDE
			0.28 o,p DDE
			0.11 Heptachlor
Pollen - Vial 1	7/21	1333	N
Bees	8/12	1456	T p,p DDE
			0.18 o,p DDE
			T Dieldrin
Pollen - Vial 1	8/18	1682	N
Bees	8/13	1687	0.11 Aldrin
			0.16 Lindane
			0.32 p,p DDT
			0.53 o,p DDT
			0.11 p,p DDE
			0.23 o,p DDE
			0.17 Dieldrin
			T Heptachlor
			0.13 Heptachlor Epox.
Bees	8/20	1689	T Aldrin
			0.12 Lindane
			0.22 Endrin
			T Heptachlor
Bees	8/17,18,21	1850	0.18 Lindane
			0.13 p,p DDT
			0.71 o,p DDT
			0.1 p,p DDE
			0.18 o,p DDE
			T Heptachlor

GRA - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	8/28	G4-2039	T Lindane
			0.12 p,p DDT
			T p,p DDE
			0.19 o,p DDE
			0.28 Dieldrin
			T Heptachlor
Bees	9/1	2040	0.1 Aldrin
			0.14 Lindane
			0.16 p,p DDT
			0.13 p,p DDE
			0.11 o,p DDE
			0.16 Heptachlor
Nectar	8/31	2042	N
Bees	9/3	2045	T Lindane
			0.24 p,p DDT
			0.18 o,p DDT
			0.2 p,p DDE
			0.11 o,p DDE
			T Endrin
Bees	9/17	2221	1.52 o,p DDT
			T p,p DDE
			0.92 o,p DDE
			T Dieldrin
Bees	9/5	2224	0.11 p,p DDT
			T o,p DDT
			0.1 p,p DDE
			0.29 o,p DDE
			0.15 Dieldrin
			1.58 Endrin
Bees	9/9	2225	T p,p DDT
			T o,p DDT
			0.18 p,p DDE
			0.31 o,p DDE
			0.17 Dieldrin
			0.12 Heptachlor
Bees	9/10	2226	0.18 Lindane
			0.34 p,p DDT
			0.41 o,p DDT
			0.15 p,p DDE
			0.88 o,p DDE
			0.31 Dieldrin
			0.95 Endrin
			0.23 Heptachlor

GRA - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	9/4	G4-2227	0.29 p,p DDT 0.17 o,p DDT T p,p DDE 0.4 o,p DDE T Dieldrin 0.17 Heptachlor 0.31 Parathion
Bees	9/11	2324	0.18 p,p DDT 0.11 p,p DDE 0.4 o,p DDE 0.23 Dieldrin 0.23 Endrin
Bees	9/14-17	2325	T Lindane 0.4 p,p DDT 0.3 o,p DDT 0.15 p,p DDE 0.5 o,p DDE 0.34 Dieldrin 0.6 Endrin 0.13 Heptachlor 1.3 Parathion
Pollen - Vial 1	9/22	2500	N
Nectar	9/22	2501	N
Bees	9/21	2504	0.1 Aldrin 0.2 Lindane 0.15 p,p DDT 0.13 o,p DDT 0.7 DDE 0.49 o,p DDE 0.3 Dieldrin 0.14 Heptachlor 0.51 Methyl Parathion 0.59 Parathion
Pollen - Hive 6 Vial 1	8/14	2674	1.4 Dieldrin
Pollen - Hive 6 Vial 2	8/14	2675	N
Pollen - Hive 6 Vial 3	8/14	2676	N

GRA - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Pollen - Hive 6 Vial 4	8/14	G4-2677	0.55 o,p DDE 0.5 Heptachlor Epox.
Pollen - Hive 6 Vial 5	8/14	2678	1.0 p,p DDT 2.3 p,p DDE 1.8 o,p DDE
Pollen - Hive 6 Vial 6	8/14	2679	10.2 p,p DDT 3.9 o,p DDT 8.2 o,p DDE
Pollen - Hive 6 Vial 1	10/13	2689	N
Pollen - Hive 6 Vial 2	10/13	2690	N
Pollen - Hive 6 Vial 3	10/13	2691	N
Pollen - Hive 6 Vial 4	10/13	2692	0.46 Aldrin 3.2 o,p DDE
Pollen - Hive 6 Vial 5	10/13	2693	0.9 p,p DDT
Pollen - Hive 6 Vial 1	8/4	2694	N
Pollen - Hive 6 Vial 2	8/4	2695	N
Pollen - Hive 6 Vial 3	8/4	2696	N
Pollen - Hive 6 Vial 4	8/4	2697	2.0 p,p DDT 1.4 o,p DDE
Pollen - Hive 6 Vial 5	8/4	2698	1.0 p,p DDT 0.5 o,p DDT 0.9 o,p DDE

GRA - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Pollen - Hive 6			
Vial 6	8/4	G4-2699	9.0 p,p DDT 13.0 p,p DDE 7.5 o,p DDE
Pollen - Hive 6			
Vial 7	8/4	2700	0.14 Aldrin 0.44 p,p DDT 0.5 o,p DDE
Pollen - Hive 6			
Vial 1	10/7	2701	1.47 p,p DDT 0.48 p,p DDE 0.5 o,p DDE
Pollen - Hive 6			
Vial 3	10/7	2703	24.6 p,p DDT 13.2 p,p DDE 18.6 o,p DDE
Pollen - Hive 6			
Vial 1	7/12	2704	N

Supplemental Information Added 12/11/64

GRA - Crop Samples

Material sampled	Date 1964	Log number	Pesticides found ppm
Soybeans - Block 3 Whole Plant	10/13	G4-2767	1.07 Dieldrin 0.66 Methyl Parathion
Milo - Block 5	9/5	2136	0.62 p,p DDE
Milo - Block 5	9/5	2139	0.35 Lindane 0.34 p,p DDT 0.23 o,p DDT 0.37 p,p DDE 0.8 o,p DDE
Soybeans - Block 6 Whole Plant	10/13	2768	0.36 Dieldrin 1.17 DEF
Milo - Block 7	9/5	2138	N
Soybeans - Block 11 Whole Plant	10/19	2765	N
Soybeans - Block 11 Whole Plant	10/19	2769	N
Soybeans - Block 12 Whole Plant	10/19	2772	N
Soybeans - Block 14 Whole Plant	10/19	2771	0.1 o,p DDT 0.32 DDE 0.37 Dieldrin 0.56 Methyl Parathion
ADDED 12/11/64			
Forage (Grass) - Block 1	6/10	699	0.35 Lindane 0.28 p,p DDE 0.05 Dieldrin
Milo - Block 7	9/5	2137	0.35 Lindane 0.35 p,p DDT 0.08 p,p DDE
Soybeans - Block 6 Whole Plant	10/13	2770	0.24 Lindane 1.0 p,p DDT 0.36 o,p DDT 0.14 p,p DDE 0.16 o,p DDE 0.17 Dieldrin

GRA - Miscellaneous Samples

Material sampled	Date 1964	Log number	Pesticides found ppb	ppm
Soil Insects - Block 8	6/29	G4-784		N
Soil Insects - Block 1	7/9	813		N
Water - Used to wash bee supers	8/18	1536	N	
Algae - Location 5	8/14	1690		0.26 Methyl Parathion
Snake - Location 5	9/10	2223		T p,p DDT 0.18 p,p DDE
ADDED 12/11/64				
Turtle - Location 4 (*Chrysemys picta belli* (Gray))	8/18	1678		0.26 Lindane T p,p DDE 0.24 o,p DDE T Dieldrin T Endrin
Turtles - Location 4 (*Chrysemys picta belli* (Gray))	9/23	2486		0.21 Lindane 0.12 p,p DDE 0.3 o,p DDE 0.12 Dieldrin
Mice - Block 4	8/27	1852		0.27 Lindane 0.79 p,p DDT 0.27 o,p DDT 0.1 p,p DDE 0.38 o,p DDE 0.23 Dieldrin T Endrin
Minnows - Location 5	8/12	1454		3.1 p,p DDT 3.8 o,p DDT 1.83 o,p DDE 0.55 p,p DDE 0.31 Dieldrin
Frogs - Location 6	8/10	1455		0.15 o,p DDT 0.15 Endrin
Tadpoles - Location 6	8/25	1853		0.29 o,p DDT

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Material sampled	Date 1964	Log number	Pesticides found ppb	ppm
ADDED 12/11/64				
Fish - Location 6	9/10	G4-2222		0.35 Lindane 0.21 p,p DDT 1.07 o,p DDT 0.35 p,p DDE 0.11 Dieldrin
Pollen - Block 9	10/7	2789		N
Snake - Location 4	8/12	1457		0.21 Lindane 0.44 p,p DDT 0.28 o,p DDT 0.63 p,p DDE 0.28 Dieldrin 0.13 Endrin
Queen Bees - Block 9	9/22	2502	(A)	Hive 6 T Lindane T p,p DDT T o,p DDE 0.36 Dieldrin
			(B)	Hive 62 T Lindane 0.12 p,p DDT T p,p DDE T o,p DDE 0.3 Dieldrin 0.33 Endrin

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]		[illegible]
[illegible]		[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]			

BIOLOGICAL RECORD

LIGHT TRAP COLLECTIONS

Indicator Species	Totals-Operated One Night Per Week								
	June 17	June 26	July 2	July 9	July 16	July 23	July 30	Aug. 6	Aug. 13
Click beetles	16	6	200+	247+	3	13	7	23	0
Calosoma spp. (Predatory ground beetles)	3	0	0	9	5	3	3	4	0
Blister beetles	40	0	58	18	20	22	2	3	1
Dyscinetus spp. and *Cyclocephala* spp. (scarabs)	0	0	4	0	0	0	0	0	0
Spotted cucumber beetle	2	2	6	47	2	7	29	29	0
Tiger beetles	8	6	38	7	0	1	2	2	0
Giant Water bug	0	0	0	0	0	0	0	0	0
Southern green stink bug	3	0	1	10	0	0	5	0	0
Treehoppers	0	0	0	0	0	0	0	0	0
Protoparce spp. (hornworm moths)	2	1	5	0	1	3	12	1	2
Salt-marsh caterpillar	0	0	0	0	1	3	2	9	3

GRA

	Totals-Operated One Night Per Week						
Indicator Species	Aug. 20	Aug. 27	Sept. 3	Sept. 10	Sept. 17	Sept. 24	Oct. 1
Click beetles	2	4	0	2	7	0	0
Calosoma spp. (Predatory ground beetles)	2	0	0	0	1	0	1
Blister beetles	11	2	2	1	0	0	0
Dyscinetus spp. and Cyclocephala spp. (scarabs)	0	0	0	0	0	0	0
Spotted cucumber beetle	1	1	3	3	5	0	0
Tiger beetles	6	2	0	0	0	0	0
Giant Water bug	0	0	0	0	0	0	0
Southern green stink bug	0	0	0	0	0	0	0
Treehoppers	0	0	0	0	0	0	0
Protoparce spp. (hornworm moths)	2	10	11	10	3	0	2
Salt-marsh caterpillar	5	8	30	23	9	2	0

GRA

BIOLOGICAL RECORD

NUISANCE PESTS

CHIGGERS

(Average Number Per Chigger Board-Counts Made Once Per Week)

July 4		July 11		July 14		July 29		Aug. 5		Aug. 12		Aug. 18	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	1	0	1

Aug. 25		Sept. 2		Sept. 9		Sept. 14		Sept. 21		Oct. 1	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	3	0	0	0	0	2	0	0	0	0	2

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

NUISANCE PESTS

MOSQUITOES

(Total Larvae Per Five Dips-One Collection Weekly)

July 4		July 10		July 15		July 26		July 30		Aug. 7		Aug. 12	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
3	8	0	0	1	5	0	25	25+	1	25+	0	25+	3

Aug. 20		Aug. 25		Sept. 4		Sept. 10		Sept. 15		Sept. 21		Oct. 1	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	10	0	0	0	10	0

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

NUISANCE PESTS

HOUSE FLIES

(Average Per Grid-Counts Made Once Per Week)

June 12		June 16		June 22		June 29		July 7		July 13		July 23		July 28	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
2	5	3	2	2	5	2	1	3	0	1	2	2	1	1	3

Aug. 4		Aug. 10		Aug. 18		Aug. 24		Aug. 31		Sept. 9		Sept. 15		Sept. 21		Oct. 1	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
1	0	0	0	1	1	1	0	3	5	0	5	0	3	0	0	0	0

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

NUISANCE PESTS

TABANIDS

(Average Number Per Animal-Counts Made Once Per Week)

June 11		June 16		June 22		July 1		July 11		July 14		July 27		Aug. 4	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
4.4	4.8	.8	.4	0	0	0	0	.8	0	.4	0	.6	.4	1	0

Aug. 10		Aug. 19		Aug. 20		Aug. 24		Sept. 2		Sept. 9		Sept. 15		Sept. 21		Oct. 1	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
4	0	.6	.4	.6	.4	0	.2	0	0	0	0	.2	.4	.2	0	.4	0

S1=Sample One
S2=Sample Two

GRA

BIOLOGICAL RECORD

NUISANCE PESTS

TICKS

(Adults and Nymphs Per Ten 100-Foot Drags-One Collection Weekly)

June 16		June 24		July 4		July 11		July 14		July 28		Aug. 4		Aug. 12	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Aug. 18		Aug. 20		Aug. 25		Sept. 2		Sept. 9		Sept. 14		Sept. 21		Oct. 1	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

S1=Sample One
S2=Sample Two

GRA

1964 WEATHER DATA GRA

MAY

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	75	56	–	–	0
2	80	62	–	–	.70
3	80	58	–	–	0
4	81	61	–	–	0
5	81	61	–	–	0
6	84	61	–	–	0
7	84	67	–	–	0
8	85	66	–	–	T
9	87	69	–	–	0
10	80	68	–	–	.10
11	86	71	–	–	0
12	85	64	–	–	.05
13	84	55	–	–	T
14	79	53	–	–	0
15	78	51	–	–	0
16	83	54	–	–	0
17	87	57	–	–	0
18	90	59	–	–	0
19	93	63	–	–	0
20	93	68	–	–	0
21	92	66	–	–	T
22	95	66	–	–	0
23	92	68	–	–	.16
24	85	68	–	–	0
25	90	67	–	–	0
26	94	69	–	–	0
27	97	70	–	–	0
28	97	74	–	–	.02
29	88	53	–	–	T
30	80	58	–	–	.03
31	78	61	–	–	.42

JUNE

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	64	58	–	–	.17
2	76	55	–	–	0
3	82	59	–	–	0
4	83	56	–	–	0
5	89	58	–	–	0
6	89	63	–	–	0
7	89	63	–	–	0
8	94	69	–	–	0
9	93	70	–	46	0
10	96	76	98	41	0
11	97	74	98	32	0
12	100	75	97	38	T
13	99	75	91	37	0
14	96	76	88	36	0
15	97	73	98	36	0
16	97	76	100	45	.12
17	90	71	100	40	0
18	94	71	94	38	0
19	95	75	92	40	0
20	96	76	92	40	0
21	96	69	94	38	0
22	99	74	94	32	T
23	101	76	90	47	0
24	94	73	100	26	0
25	93	65	78	29	0
26	94	64	72	34	0
27	95	72	93	40	0
28	95	70	92	32	0
29	95	74	97	46	.71
30	94	70	100	54	.30

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1964 WEATHER DATA GRA

JULY

Date	Temperature		Humidity		Rain-fall
	Max.	Min.	Max.	Min.	
1	88	70	100	46	0
2	92	72	100	50	0
3	87	69	100	64	.55
4	84	69	100	48	0
5	93	73	100	40	0
6	98	76	97	41	0
7	99	73	99	30	0
8	100	79	92	32	0
9	101	73	100	60	.38
10	90	68	100	61	0
11	90	74	100	70	.03
12	86	76	100	56	0
13	88	67	100	32	0
14	82	58	100	30	0
15	90	66	96	48	0
16	91	68	100	44	0
17	92	67	100	38	.08
18	94	71	99	34	0
19	94	69	100	34	0
20	98	73	96	40	0
21	98	75	-	37	0
22	97	74	96	35	0
23	95	71	99	38	T
24	95	72	100	44	0
25	95	74	100	40	0
26	96	73	97	52	0
27	93	70	100	46	.88
28	93	73	100	48	.10
29	93	75	98	52	0
30	92	72	100	56	.28
31	92	72	100	44	T

AUGUST

Date	Temperature		Humidity		Rain-fall
	Max.	Min.	Max.	Min.	
1	95	72	100	50	0
2	91	71	100	44	0
3	95	73	100	42	0
4	99	75	98	30	0
5	102	75	96	44	0
6	95	72	100	36	T
7	95	73	100	40	0
8	96	74	100	44	T
9	94	71	100	44	0
10	95	73	100	-	T
11	95	75	100	52	T
12	93	72	100	50	.90
13	80	58	100	38	.18
14	82	63	100	50	0
15	86	69	-	-	.03
16	88	69	100	63	3.00
17	76	66	100	82	.04
18	81	63	100	60	0
19	84	61	100	62	0
20	88	68	100	44	0
21	90	73	99	52	0
22	90	68	93	58	.15
23	84	72	97	64	0
24	88	71	99	60	T
25	88	71	100	57	.18
26	90	68	100	50	.45
27	87	65	100	52	.16
28	90	71	100	44	0
29	93	71	100	42	0
30	89	72	100	56	0
31	87	72	100	68	T

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

1964 WEATHER DATA <u>GRA</u>

SEPTEMBER

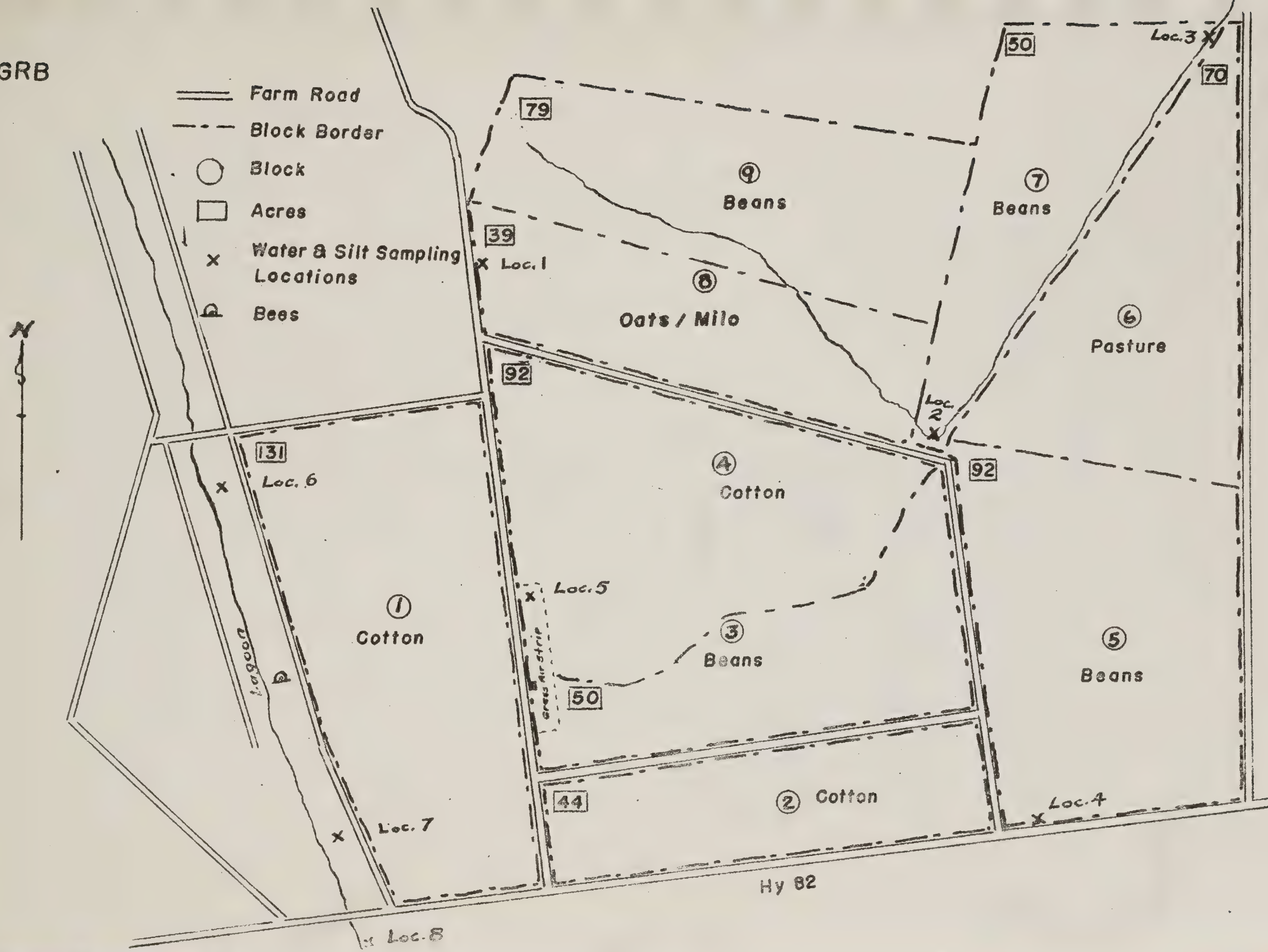
Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	95	71	100	42	0
2	95	66	98	30	.21
3	94	64	100	32	0
4	96	70	100	37	0
5	96	69	100	40	0
6	95	70	100	38	0
7	92	71	100	50	T
8	92	68	100	46	T
9	93	65	100	37	0
10	92	61	100	36	0
11	90	67	100	52	0
12	79	62	94	34	0
13	76	57	74	38	0
14	81	46	100	30	0
15	86	47	100	33	0
16	85	64	100	52	T
17	80	69	100	88	.12
18	88	70	100	46	.09
19	90	63	100	46	0
20	92	64	100	40	0
21	91	68	100	45	0
22	90	66	100	50	0
23	86	68	100	56	0
24	82	64	86	28	0
25	85	50	100	25	0
26	87	54	100	31	0
27	85	72	100	72	T
28	59	56	100	100	0
29	67	59	100	90	2.30
30	72	62	100	82	.14

OCTOBER

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	80	6[illegible]	100	70	0
2	82	68	100	70	0
3	76	66	98	81	0
4	72	58	100	36	0
5	64	50	72	34	.03
6	63	40	100	30	0
7	68	36	100	28	0
8	75	40	100	34	0
9	64	48	100	40	0
10	67	38	98	28	0
11	71	37	100	24	0
12	76	40	100	37	0
13	74	46	100	41	0
14	62	58	100	86	0
15	66	50	100	62	.93
16	77	48	100	44	0
17	84	55	100	40	0
18	84	52	100	46	0
19	62	42	90	22	0
20	64	34	100	26	0
21	76	38	100	22	0
22	78	42	100	30	0
23	69	45	72	28	0
24	72	40	98	28	0
25	75	38	100	28	0
26	76	44	100	40	0
27	80	50	100	50	0
28	79	54	100	50	0
29	80	52	100	48	0
30	72	50	100	30	0
31	72	42	100	34	0

7-A

GRB



Farm Road
Block Border
Block
Acres
Water & Silt Sampling Locations
Bees
N
79
9
Beans
50
7
Beans
Loc. 3
70
39
Loc. 1
8
Oats / Milo
6
Pasture
Loc. 2
92
92
4
Cotton
131
Loc. 6
Loc. 5
1
Cotton
Lagoon
3
Beans
50
Grass Air Strip
5
Beans
44
2
Cotton
Loc. 4
Loc. 7
Hy 82
Loc. 8

LEGEND

Analysis incomplete	-	These samples will be re-examined in light of improved techniques.
Arsenic	-	All arsenic analyses are reported as metallic arsenic. If no figure is given, it means that arsenic was not run on that particular sample.
N	-	Less than 0.05 p.p.b. in water, or less than 0.05 p.p.m. in other samples. If only arsenic analysis is reported, it means that the sample was negative for chlorinated hydrocarbons.
p.p.b.	-	Parts per billion.
p.p.m.	-	Parts per million.
T	-	Trace is less than 0.10 p.p.b. in water, or less than 0.10 p.p.m. in all other samples.

Note: Analysis of phosphates were made only on selected samples.

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 1 (131 Acres of cotton)

Date applied	DDT	Diuron	Methyl Parathion	Sodium Chlorate	Remarks
1959-1963	0.5		0.25		Applied 10 times a year.
1964					
6/26	0.33		0.18		
7/6		0.75			
8/3	0.5		0.25		
8/7	0.5		0.25		
8/13	0.5		0.25		
8/18	1.0		0.25		
8/24	1.0		0.25		
8/25	1.0		0.25		
8/31	1.0		0.25		
9/1	1.0		0.25		
9/7	1.0		0.25		
9/21				3.0	

GRB - Soil Samples

GRB - Block 1

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-61	0.05 Lindane 3.86 p,p DDT T o,p DDT 0.25 DDE 8.8 Arsenic
6/2	62	0.35 p,p DDT 0.12 o,p DDT T DDE 9.6 Arsenic
6/22	300	2.76 p,p DDT 0.3 o,p DDT 0.1 DDE 10.9 Arsenic
6/22	301	1.84 p,p DDT 0.37 o,p DDT 0.61 DDE 9.1 Arsenic
7/18	858	1.3 p,p DDT 0.93 o,p DDT 0.27 DDE 11.6 Arsenic
7/18	859	T Lindane 1.25 p,p DDT 0.58 o,p DDT 0.38 DDE T Dieldrin 3.9 Arsenic
8/21	1753	T Lindane 1.09 p,p DDT 0.7 o,p DDT 0.16 DDE
8/21	1754	1.04 p,p DDT T o,p DDT T DDE
8/27	1755	3.0 p,p DDT 0.77 o,p DDT 0.26 DDE

GRB - Soil Samples

GRB - Block 1 (Cont'd.)

Date sampled 1964	Log number	Pesticides found ppm
8/27	G4-1756	T Lindane 4.78 p,p DDT T o,p DDT T DDE
8/27	1757	Analysis incomplete
9/10	2084	T Lindane 1.01 p,p DDT 0.5 o,p DDT 0.21 DDE
9/10	2086	T Lindane 1.2 p,p DDT 0.58 o,p DDT 0.2 DDE

BIOLOGICAL RECORD

SWEEP NET

BLOCK 1-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	0	1	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	1	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 21	Aug. 27	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 1-COTTON

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly													
	June 20*		July 5		July 14		Aug. 1		Aug. 28		Sept. 11		Sept. 21	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0	0	0	0	0	0	0	0	0	0	0	0
Spiders	0		0	0	0	0	0	0	1	0	0	0	0	0
Ground beetles	0		0	0	0	0	3	0	1	0	0	1	0	0
Earwigs	0		0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	0	0	0	0	1	0	0
Field crickets	0		0	0	1	0	2	0	0	0	0	0	0	0

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 1-COTTON

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	July 9		July 21		Aug. 12		Sept. 8	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 2 (44 Acres of cotton)

Date applied	DDT	Disodium Methyl Arsonate	Methyl Parathion	Sodium Chlorate	Remarks
1959-1960	0.5		0.25		Applied 10 times a year.
1961-1963					None applied.
1964					
6/17		1.0			
6/29	0.33		0.18		
8/3	0.5		0.25		
8/7	0.5		0.25		
8/13	0.5		0.25		
8/18	1.0		0.25		
8/25	1.0		0.25		
8/31	1.0		0.25		
9/1	1.0		0.25		
9/7	1.0		0.25		
10/7				3.0	

GRB - Soil Samples

GRB - Block 2

Date Sampled 1964	Log number	Pesticides found ppm
6/2	G4-63	1.06 p,p DDT T DDE 8.5 Arsenic
6/2	64	1.14 p,p DDT 8.7 Arsenic
6/30	365	0.96 p,p DDT 8.9 Arsenic
6/30	366	0.96 p,p DDT 9.1 Arsenic
7/18	860	2.8 p,p DDT 8.6 Arsenic
7/18	861	0.81 p,p DDT 0.29 o,p DDT 0.2 DDE 6.4 Arsenic
8/10	1389	1.9 p,p DDT 0.88 o,p DDT 0.42 DDE 0.18 Endrin 8.5 Arsenic
8/10	1388	0.9 p,p DDT 0.41 o,p DDT 0.15 DDE 9.5 Arsenic
9/15	2261	2.9 p,p DDT 1.6 o,p DDT 0.39 DDE
9/15	2263	0.9 p,p DDT 0.3 o,p DDT T Dieldrin Analysis incomplete

BIOLOGICAL RECORD

SWEEP NET

BLOCK 2-COTTON

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5	Aug. 12
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

	Aug. 21	Aug. 27	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	0	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 3 (50 Acres of soybeans)

Date applied	DDT	Methyl Parathion	Remarks
1959-1960	0.5	0.25	Applied 10 times a year.
1961-1963			None applied.
1964 9/8		1.0	

GRB - Soil Samples

GRB - Block 3

Date sampled 1964	Log number	Pesticides found ppm
6/2	G4-65	1.3 p,p DDT 0.13 DDE 12.5 Arsenic
6/2	66	1.1 p,p DDT 12.3 Arsenic
6/23	302	0.9 p,p DDT 0.11 o,p DDT 11.0 Arsenic
6/23	303	0.97 p,p DDT 0.15 o,p DDT 10.6 Arsenic
7/20	862	0.48 p,p DDT 0.24 o,p DDT 0.17 DDE 11.2 Arsenic
7/20	863	9.5 Arsenic T Lindane 0.56 p,p DDT 0.41 o,p DDT 0.18 DDE
8/31	1930	0.81 p,p DDT 0.36 o,p DDT 0.11 DDE T Endrin 0.03 Methyl Parathion
8/31	1931	1.4 p,p DDT 1.3 o,p DDT 0.13 DDE T Dieldrin
10/6	2618	Analysis incomplete
10/6	2621	0.94 p,p DDT 0.62 o,p DDT 0.16 DDE

BIOLOGICAL RECORD

SWEEP NET

BLOCK 3-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5	Aug. 12
Grasshoppers	0	0	1	1	0	0	0	1
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	1	0	0	0	0	0	0
Lady beetles	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0

GRB

7-B

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 3-SOYBEANS

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly															
	June 18*		July 5		July 14		July 29		Aug. 11		Aug. 26		Sept. 11		Sept. 21	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spiders	1		0	0	0	0	1	1	0	1	0	0	0	0	0	0
Ground beetles	4		5	1	20	15	10	10	5	7	1	0	0	0	1	0
Earwigs	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Field crickets	0		16	0	0	2	2	2	2	2	0	0	2	0	0	1

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 3-SOYBEANS

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	July 9		July 17		Aug. 11		Sept. 8	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 4 (92 Acres of cotton)

Date applied	DDT	Methyl Parathion	Sodium Chlorate	Remarks
1959-1961	0.5	0.25		Applied 10 times a year.
1962				None applied.
1963	0.5	0.25		Applied 10 times a year.
1964				Applications in 1964 covered 50 acres.
6/29	0.33	0.18		
7/31	0.5	0.25		
8/3	0.5	0.25		
8/7	0.5	0.25		
8/13	0.5	0.25		
8/18	1.0	0.25		
8/25	1.0	0.25		
8/31	1.0	0.25		
9/1	1.0	0.25		
9/7	1.0	0.25		
10/7			3.0	

GRB - Soil Samples

GRB - Block 4

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-67	1.6 DDT 15.6 Arsenic
6/3	68	4.1 DDT 8.7 Arsenic
6/30	367	0.57 p,p DDT 0.5 o,p DDT 2.03 DDE 13.6 Arsenic
6/30	368	1.78 p,p DDT 0.17 o,p DDT T DDE 9.7 Arsenic
7/15	642	1.2 p,p DDT 0.64 o,p DDT 0.28 DDE 7.0 Arsenic
7/15	643	1.37 p,p DDT 0.64 o,p DDT 0.23 DDE 12.4 Arsenic
8/20	1603	1.26 p,p DDT 0.62 o,p DDT 0.12 DDE 0.58 Methyl Parathion
8/20	1604	1.06 p,p DDT 0.52 o,p DDT 0.19 DDE T Endrin 0.61 Methyl Parathion
9/15	2262	2.2 p,p DDT 1.3 o,p DDT 0.42 DDE 0.19 Methyl Parathion
9/15	2269	2.3 p,p DDT 1.8 o,p DDT 0.12 DDE 0.36 Methyl Parathion

BIOLOGICAL RECORD

SWEEP NET

BLOCK 4-COTTON

	Totals Per 100 Sweeps-One Collection Per Week							
Indicator Species	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5	Aug. 12
Grasshoppers	0	0	0	0	0	0	0	0
Lady beetles	0	1	1	2	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 21	Aug. 27	Sept. 2	Sept. 7	Sept. 14	Sept. 24	Oct. 5	
Grasshoppers	0	0	0	0	0	0	0	
Lady beetles	0	0	0	0	0	0	0	
Bumble bees	0	0	0	0	0	0	0	

GRB

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 4-COTTON

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly													
	June 20*		July 5		July 22		Aug. 6		Sept. 3		Sept. 16		Oct. 7	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0	0	37	0	0	0	0	0	0	0	0	5
Spiders	2		0	0	0	0	1	1	0	0	1	0	0	0
Ground beetles	3		1	4	1	0	2	0	2	0	1	0	3	5
Earwigs	0		0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	1	0	0	0	0	0	1	0	1	0
Field crickets	0		1	0	2	0	0	0	0	0	0	0	1	0

*One sample taken.

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 4-COTTON

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	July 9		July 27		Aug. 20		Sept. 21	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 5 (92 Acres of soybeans)

Date applied	Toxaphene	Remarks
1959		None applied.
1960	2.0	
1961-1964		None applied.

GRB - Soil Samples

GRB - Block 5

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-69	T p,p DDT 11.9 Arsenic
6/3	70	12.5 Arsenic
6/3	71	2.7 Arsenic
6/30	369	0.12 p,p DDT 12.2 Arsenic
6/30	370	12.1 Arsenic
7/21	864	8.3 Arsenic
7/21	865	0.24 p,p DDT 0.14 o,p DDT T DDE 9.4 Arsenic
8/10	1390	0.41 p,p DDT 8.7 Arsenic
8/10	1391	0.86 p,p DDT 0.14 Dieldrin 13.6 Arsenic
9/8	2080	N
9/8	2082	N

BIOLOGICAL RECORD

SWEEP NET

BLOCK 5-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 18	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	2	1	2	0	0	0	0	0
Lady beetles	0	0	1	0	1	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 24	Oct. 5
Grasshoppers	1	1	0	0	1	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 6 (70 Acres of pasture)

Date applied	Ammonium Nitrate	Toxaphene	Remarks
1960		2.0	
1961-1963			None applied.
1964 10/20	32.0		

GRB - Soil Samples

GRB - Block 6

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-71	2.7 Arsenic
6/3	72	3.1 Arsenic
6/30	371	3.6 Arsenic
6/30	372	0.18 p,p DDT 3.7 Arsenic
7/16	644	0.14 DDE T Heptachlor 2.5 Arsenic
7/16	645	1.4 Arsenic
8/10	1392	0.25 p,p DDT 0.14 o,p DDT 0.14 DDE 3.2 Arsenic
8/10	1393	0.37 p,p DDT 0.14 o,p DDT 0.11 DDE 2.4 Arsenic
9/8	2081	0.14 p,p DDT 0.08 o,p DDT 0.34 DDE 0.28 Methyl Parathion
9/8	2083	0.1 Methyl Parathion

BIOLOGICAL RECORD

SWEEP NET

BLOCK 6-PASTURE

	Totals Per 100 Sweeps-One Collection Per Week							
Indicator Species	June 18	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	65	15	1	6	6	4	3	1
Lady beetles	1	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 24	Oct. 5
Grasshoppers	2	0	2	0	4	0	1	3
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 6-PASTURE

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly														
	June 18*		June 30		July 22		Aug. 4		Aug. 19		Sept. 3		Sept. 16		Oct. 7
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	1		12	0	5	0	0	0	0	0	0	3	7	5	3	2
Spiders	2		2	1	1	0	1	0	0	0	0	3	2	0	1	1
Ground beetles	0		0	2	1	0	0	2	2	5	0	0	0	0	7	1
Earwigs	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0	0	0	0	0	0	0	0	0	0	3	0	0	0
Field crickets	0		1	1	7	18	7	7	4	1	2	5	2	1	5	1

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 6-PASTURE

Indicator Species	Totals Per Sample-Five 5-Inch Cores (One Foot Deep) Collected Monthly							
	June 29		July 17		Aug. 19		Oct. 6	
	S1	S2	S1	S2	S1	S2	S1	S2
White Grubs	0	0	0	0	0	1	0	0
Wireworms	0	1	0	0	0	0	0	0
Earthworms	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 7 (50 Acres of soybeans)

Date applied	Toxaphene	Remarks
1959		None applied.
1960	2.0	
1961-1964		None applied.

GRB - Soil Samples

GRB - Block 7

Date sampled 1964	Log number	Pesticides found ppm
6/3	G4-73	4.0 Arsenic
6/3	74	3.5 Arsenic
7/9	554	4.9 Arsenic
7/9	555	4.6 Arsenic
7/28	980	0.34 p,p DDT T o,p DDT 4.2 Arsenic
7/28	981	0.3 p,p DDT T o,p DDT 0.15 DDE 3.5 Arsenic
8/31	1932	T p,p DDT T o,p DDT T DDE T Endrin
9/21	2459	0.13 p,p DDT
9/21	2462	N

BIOLOGICAL RECORD

SWEEP NET

BLOCK 7-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 19	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	1	4	0	2	2	2	2	0
Lady beetles	0	0	1	0	0	2	1	4
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	1	1	2	0	0	0	0	0
Lady beetles	0	1	0	1	1	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 8 (39 Acres of oats)

Date applied	Toxaphene	Remarks
1959		None applied.
1960	2.0	
1961-1964		None applied.

GRB - Soil Samples

GRB - Block 8

Date sampled 1964	Log number	Pesticides found ppm
6/4	G4-75	3.4 Arsenic
6/4	76	5.3 Arsenic
7/8	556	5.9 Arsenic
7/8	557	3.9 Arsenic
7/21	866	0.11 Lindane T p,p DDT 0.14 o,p DDT 0.12 DDE 0.11 o,p DDE 0.11 Heptachlor 7.1 Arsenic
7/21	867	N
8/20	1605	N
8/20	1606	N
9/21	2460	T p,p DDT
9/21	2461	0.78 p,p DDT 0.11 DDE

BIOLOGICAL RECORD

SWEEP NET

BLOCK 8-OATS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 19	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	1	0	0	0	0	1	0	0
Lady beetles	0	2	3	3	2	12	5	1
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	0	0	0	0	3	0	0	0
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

7-B

BIOLOGICAL RECORD

PITFALL TRAPS

BLOCK 8-OATS

Indicator Species	Total Number Per Composite (3 Traps) Sample-Collected Bi-Weekly																	
	June 18*		June 30*		July 5*		July 22		Aug. 4		Aug. 21		Sept. 3		Sept. 16		Oct. 7	
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
Ants	0		0		0		10	2	0	0	0	6	0	0	0	0	3	17
Spiders	0		0		0		0	0	0	1	2	1	4	0	0	0	1	1
Ground beetles	23		5		13		0	1	1	2	10	8	3	1	3	2	18	12
Earwigs	0		0		0		0	0	0	0	0	0	0	0	0	0	0	0
Rove beetles	0		0		0		1	0	1	0	1	1	0	0	0	0	0	1
Field crickets	4		0		1		1	2	1	2	23	1	3	0	1	1	74	2

*Only one sample taken.

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

SOIL SAMPLES

BLOCK 8-OATS

Indicator Species	June 30 S1	June 30 S2	July 27 S1	July 27 S2	Aug. 20 S1	Aug. 20 S2	Sept. 21 S1	Sept. 21 S2
	Totals Per Sample-Five 5 Inch Cores (One Foot Deep) Collected Monthly							
White Grubs	0	0	1	3	0	0	0	0
Wireworms	0	0	0	0	0	0	0	0
Earthworms	0	5	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

CHEMICAL TREATMENT HISTORY
Pounds Of Technical Material Per Acre

GRB - Block 9 (79 Acres of soybeans)

Date applied	Methyl Parathion	Toxaphene	Remarks
1959			None applied.
1960		2.0	
1961-1963			None applied.
9/9/64	1.0		

GRB - Soil Samples

GRB - Block 9

Date sampled 1964	Log number	Pesticides found ppm
6/4	G4-77	T p,p DDT 5.0 Arsenic
6/4	78	5.8 Arsenic
7/8	558	5.9 Arsenic
7/8	559	5.5 Arsenic
7/27	982	5.5 Arsenic
7/27	983	5.2 Arsenic
8/24	1760	N
8/24	1761	N
10/6	2617	0.15 p,p DDT T o,p DDT T DDE
10/6	2619	0.15 p,p DDT 0.11 o,p DDT

BIOLOGICAL RECORD

SWEEP NET

BLOCK 9-SOYBEANS

Indicator Species	Totals Per 100 Sweeps-One Collection Per Week							
	June 19	June 25	July 4	July 9	July 13	July 24	July 30	Aug. 5
Grasshoppers	0	0	0	0	3	1	0	1
Lady beetles	0	0	0	0	0	0	0	0
Bumble bees	0	0	0	0	0	0	0	0
	Aug. 12	Aug. 19	Aug. 26	Sept. 2	Sept. 7	Sept. 14	Sept. 23	Oct. 5
Grasshoppers	0	0	0	0	1	0	0	0
Lady beetles	0	0	0	0	0	0	1	0
Bumble bees	0	0	0	0	0	0	0	0

GRB

7-B

8

GRB - Water And Silt Samples[1/]

A - Well Water
B - Water leaving the study area
C - Water running off the fields
D - Water draining onto the area from outside
E - Water flowing off fields immediately after rain

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
D Water	7	6/10	G4-227	N	
D Silt	7	6/10	252		N
D Water	6	6/10	228	N	
D Silt	6	6/10	253		0.3 p,p DDT T DDE
A Water - Irrigation water from cotton field south of area		6/16	229	0.46 Lindane	
A Water	5	6/16	230	N	
C Water	2	6/10	231	0.55 Lindane	
C Silt	2	6/10	254		N
B Silt	3	7/10	565		N
D Silt	6	7/10	571		N
D Water	6	7/10	585	N	
D Water	6	7/10	586	N	
D Water	6	7/10	587	N	
D Silt	1	7/2	575		1.9 p,p DDT
D Water	1	7/2	594	N	
C Silt	2	7/2	580		Analysis incomplete
C Water	2	7/2	592	T Lindane	
D Silt	7	7/10	581		N
D Water	7	7/10	588	N	
D Water	7	7/10	589	N	
D Water	7	7/10	590	N	
A Water	5	7/11	591		Analysis incomplete
B Water	3	7/11	593	T Lindane	
A Water	8	7/9	595	N	
B Silt	3	7/16	625		0.31 o,p DDT 0.1 p,p DDE
B Water	3	7/16	685	0.56 Lindane	

1/ Classifications B, C, D, and E also apply to silt.

[illegible]

[illegible]

GRB - Water And Silt Samples (Cont'd.)

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
C Silt	2	7/16	G4-626		T p,p DDT 0.32 o,p DDT 0.19 DDE
C Water	2	7/16	684	N	
D Water	4	7/24	960	0.14 Lindane	
D Silt	4	7/24	1041		0.58 p,p DDT 0.1 o,p DDT 0.4 DDE
D Water	1	7/24	961	N	
D Silt	1	7/24	1042		0.66 p,p DDT 1.57 o,p DDT 0.36 DDE
A Water	8	7/25	962	N	
A Water	5	7/31	1125	0.19 p,p DDT 0.52 o,p DDT 0.11 DDE	
D Water	4	8/9	1482	N	
D Silt	6	8/7	1358		T DDE 0.13 Endrin
D Water	6	8/7	1483	N	
D Water	6	8/7	1484	N	
D Water	6	8/7	1485	N	
D Silt	7	8/7	1359		T p,p DDT T o,p DDT 0.11 DDE T Dieldrin
D Water	7	8/7	1486	N	
D Water	7	8/7	1487	N	
D Water	7	8/7	1488	N	
A Water	8	8/10	1489	N	
D Silt	1	8/18	1546		T p,p DDT 0.39 o,p DDT T DDE 0.11 Endrin
D Water	1	8/18	1633	N	

GRB - Water And Silt Samples (Cont'd.)

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	Pesticides found ppm
D Silt	4	8/17	G4-1547		T Lindane 0.5 p,p DDT 1.09 o,p DDT 0.35 DDE T Dieldrin T Endrin
D Water	4	8/17	1635	N	
B Silt	3	8/17	1548		0.3 o,p DDT T DDE
B Water	3	8/17	1636	N	
C Silt	2	8/24	1802		0.12 p,p DDT 0.65 o,p DDT 0.16 DDE
C Water	2	8/24	1830	N	
D Water	4	8/21	1831	N	
D Silt	6	9/1	1952		0.06 p,p DDT 0.36 o,p DDT 0.12 DDE
D Water	6	9/1	1959	N	
D Water	6	9/1	1960	N	
D Water	6	9/1	1964	N	
D Silt	7	9/1	1949		T p,p DDT 0.47 o,p DDT 0.27 DDE
D Water	7	9/1	1955	N	
D Water	7	9/1	1957	N	
D Water	7	9/1	1958	N	
C Silt	2	9/7	2117		T o,p DDT 1.1 o,p DDT 0.2 DDE 0.15 Dieldrin
C Water	2	9/7	2149	N	
D Silt	1	9/15	2239		0.6 p,p DDT 2.8 o,p DDT 0.4 DDE T Dieldrin

GRB - Water And Silt Samples (Cont'd.)

Material sampled	Location	Date 1964	Log number	Pesticides found ppb	ppm
B Silt	3	9/15	G4-2240		0.3 p,p DDT
B Water	3	9/15	2361	N	
D Silt	4	9/28	2633		0.41 p,p DDT 0.48 o,p DDT 0.36 DDE
D Silt	6	10/2	2634		T Lindane 0.36 p,p DDT 0.4 o,p DDT 0.22 DDE
D Silt	7	10/2	2641		N

GRB - Apiary Samples

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	7/16	G4-727	0.29 p,p DDT 0.13 o,p DDT 0.22 p,p DDE 0.18 o,p DDE 0.11 Dieldrin
Nectar - Hive 3	7/3	777	N
Nectar - Hive 4	7/3	779	N
Honey - Hive 2	8/3	1172	N
Nectar	8/6	1190	N
Nectar	8/6	1191	N
Nectar	7/21	1192	N
Nectar	7/21	1193	N
Bees	8/4	1222	T Lindane 1.24 p,p DDT 0.64 o,p DDT 0.39 p,p DDE T o,p DDE T Dieldrin 0.27 Endrin T Heptachlor
Pollen	8/6	1225	N
Bees	7/30	1226	0.13 Lindane 0.13 p,p DDE 0.26 o,p DDE 0.1 Heptachlor
Bees	8/13	1453	0.41 p,p DDT 0.22 o,p DDT 0.26 p,p DDE 0.16 o,p DDE 0.11 Dieldrin 0.33 Parathion
Bees	8/20	1688	0.64 p,p DDT 0.41 o,p DDT 0.28 p,p DDE 0.31 o,p DDE 0.16 Dieldrin T Heptachlor

GRB - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	8/19	G4-1691	T Lindane 1.29 p,p DDT 0.44 o,p DDT 0.34 p,p DDE 0.14 o,p DDE T Dieldrin
Bees	8/14	1692	0.63 p,p DDT 0.38 o,p DDT 0.3 p,p DDE 0.16 o,p DDE 0.1 Dieldrin
Nectar	8/20	1735	N
Bees	8/18	1847	0.12 Dieldrin
Bees	8/25	1851	0.11 Lindane 0.88 p,p DDT 0.52 o,p DDT 0.66 p,p DDE 0.13 Heptachlor
Honey - Hive 2	8/17	1895	N
Honey - Hive 4	8/17	1896	N
Pollen - Hive 2	9/1	2041	N
Bees	9/1	2043	1.63 p,p DDT 0.61 o,p DDT 0.34 p,p DDE 0.29 o,p DDE 0.5 Dieldrin 0.33 Endrin
Bees	9/10	2229	0.67 p,p DDT 0.28 o,p DDT 0.56 p,p DDE 0.52 o,p DDE 0.56 Dieldrin 0.16 Heptachlor
Bees	9/7	2230	T Lindane 0.53 p,p DDT 0.4 o,p DDT 0.24 p,p DDE 0.29 o,p DDE 0.25 Dieldrin T Heptachlor

GRB - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Bees	9/8	G4-2231	1.03 p,p DDT 0.38 o,p DDT 0.25 DDE T Dieldrin
Bees	9/24	2507	1.39 p,p DDT 0.53 o,p DDT 0.37 p,p DDE T o,p DDE T Dieldrin T Heptachlor 0.21 Methyl Parathion 0.86 Parathion
Bees	9/22	2508	T Lindane 0.19 p,p DDT 0.18 o,p DDT 0.21 p,p DDE 0.17 o,p DDE 0.34 Dieldrin T Heptachlor 0.53 Parathion
Bees	9/23	2509	T Lindane 2.7 p,p DDT 1.4 o,p DDT 0.78 DDE 0.24 Dieldrin 0.1 Heptachlor
Pollen - Hive 2 Vial 1	8/18	2664	N
Pollen - Hive 2 Vial 2	8/18	2665	N
Pollen - Hive 2 Vial 1	8/18	2667	N
Pollen - Hive 2 Vial 2	8/18	2668	N
Pollen - Hive 2 Vial 3	8/18	2669	N
Pollen - Hive 2 Vial 4	8/18	2670	N

GRB - Apiary Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppm
Pollen - Hive 2 Vial 5	8/18	G4-2671	0.6 Heptachlor Epox.
Pollen - Hive 2 Vial 6	8/18	2672	N
Pollen - Hive 2 Vial 7	8/18	2673	1.1 p,p DDT
Pollen - Hive 2 Vial 1	9/30	2680	N
Pollen - Hive 2 Vial 2	9/30	2681	N
Pollen - Hive 2 Vial 3	9/30	2682	3.6 p,p DDT
Pollen - Hive 2 Vial 4	9/30	2683	N
Pollen - Hive 2 Vial 5	9/30	2684	14.3 p,p DDT
Pollen - Hive 2 Vial 1	10/13	2685	N
Pollen - Hive 2 Vial 2	10/13	2686	N
Pollen - Hive 2 Vial 3	10/13	2687	N
Pollen - Hive 2 Vial 4	10/13	2688	N
Pollen - Hive 2 Vial 2	9/1	2707	N
Pollen - Hive 2 Vial 3	9/1	2708	N

Supplemental Information Added 12/11/64

GRB - Crop Samples

Material sampled	Date 1964	Log number	Pesticides found ppm
Cotton - Block 1 Whole Plant	9/18	G4-2387	0.35 Lindane 5.32 p,p DDT 2.36 o,p DDT 0.55 p,p DDE 0.56 o,p DDE
Soybeans - Block 3	10/21	2750	N
Soybeans - Block 5 Whole Plant	9/24	2377	1.2 p,p DDT 0.83 o,p DDT 0.49 DDE
Sorghum Cane - Block 8	9/1	1975	0.2 Lindane 0.73 p,p DDT 0.42 o,p DDT 0.24 p,p DDE 0.42 o,p DDE
ADDED 12/11/64			
Sorghum Cane - Block 8	9/1	1976	0.24 Lindane 0.68 p,p DDT 0.15 o,p DDT 0.21 p,p DDE 0.43 o,p DDE 0.21 Dieldrin
Cotton - Block 2 Whole Plant	9/18	2392	0.13 Lindane 2.24 p,p DDT 0.31 o,p DDT 0.14 DDE 0.43 Dieldrin
Corn - Block 1 (Green forage, no grain)	7/2	701	N
Forage (Grass) _ Block 6	6/10	702	0.23 p,p DDT
Soybeans - Block 3 Whole Plant	9/24	2376	0.18 Lindane 0.3 p,p DDT 0.13 o,p DDT 0.55 p,p DDE 0.82 o,p DDE 0.55 Dieldrin

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GRB - Miscellaneous Samples

Material sampled	Date 1964	Log number	Pesticides found ppb	ppm
Soil Insects - Block 6	6/29	G4-782		N
Earthworm - Block 8	6/30	783		N
Soil Insects - Block 8	7/27	1217		N
Soil Insects - Block 6	7/17	1218		N
Soil Insects - Block 8	7/27	1219		N
Soil Insects - Block 6	7/17	1220		N
Algae - Location 6	9/3	1982		0.54 p,p DDT 0.59 o,p DDT 1.88 DDE
Algae - Location 5	9/8	2489		1.01 o,p DDT 0.62 DDE
Minnows - Block 1	8/11	1452		0.44 p,p DDT 0.47 o,p DDT 0.2 p,p DDE
ADDED 12/11/64				
Turtle - Location 6 (Pseudemys troosti elegans (Weid.))	7/30	1134		0.47 Lindane 0.31 p,p DDT T o,p DDT 0.16 p,p DDE 0.35 o,p DDE 0.14 Dieldrin
Turtle - Location 6	6/25	815		(A) Chrysemys picta belli (Gray) 0.12 Lindane 0.24 p,p DDT 0.23 o,p DDT 0.21 p,p DDE (B) Sternotherous oderatus (Latreille) 0.45 p,p DDT 0.43 o,p DDT 0.38 p,p DDE

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GRB - Miscellaneous Samples (Cont'd.)

Material sampled	Date 1964	Log number	Pesticides found ppb ppm
ADDED 12/11/64			
Turtles - Location 6	8/19	G4-1672	(A) *Amyda* sp. 0.15 Lindane 0.23 p,p DDT 0.13 p,p DDE 0.3 Dieldrin 0.33 Endrin (B) *Kinosternon subrubrum* T Aldrin 0.35 Lindane 0.59 p,p DDT 0.32 o,p DDT 0.43 p,p DDE 0.46 o,p DDE 0.11 Dieldrin T Endrin (C) *Chrysemys picta belli* 0.12 Lindane 2.6 p,p DDT 1.0 o,p DDT 0.23 p,p DDE 0.16 Dieldrin
Turtles - Block 1 (Location 7)	7/11	816	N
Turtles - Location 7	8/4	1137	T o,p DDT 2.32 p,p DDE 0.48 Dieldrin
Pollen - Block 1	7/21	1334	0.16 Lindane 0.31 p,p DDT 0.11 o,p DDT 0.16 p,p DDE 0.26 o,p DDE 0.22 Dieldrin 0.5 Endrin

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BIOLOGICAL RECORD

LIGHT TRAP COLLECTIONS

Indicator Species	Totals-Operated One Night Per Week June 17	June 25	July 2	July 9	July 16	July 23	July 30	Aug. 6
Click beetles	2	25	3	0	1	2	0	33
Calosoma spp. (Predatory ground beetles)	0	0	0	1	4	2	0	3
Blister beetles	9	19	1	1	0	4	6	42
Dyscinetus spp. and *Cyclocephala* spp. (scarabs)	0	0	0	0	0	0	0	0
Spotted cucumber beetle	0	6	2	0	0	5	6	70
Tiger beetles	0	2	0	0	0	0	0	1
Giant Water bug	1	0	0	0	0	0	0	0
Southern green stink bug	4	0	1	1	0	1	0	12
Treehoppers	0	0	0	0	0	0	0	0
Protoparce spp. (hornworm moths)	0	0	1	0	0	2	1	4
Salt-marsh caterpillar	17	0	0	0	0	1	1	6

GRB

Indicator Species	Totals-Operated One Night Per Week							
	Aug. 13	Aug. 20	Aug. 27	Sept. 3	Sept. 10	Sept. 17	Sept. 24	Oct. 1
Click beetles	2	0	3	1	0	0	0	0
Calosoma spp. (Predatory ground beetles)	1	0	3	0	0	1	2	3
Blister beetles	6	0	5	5	1	0	1	0
Dyscinetus spp. and Cyclocephala spp. (scarabs)	1	0	0	0	0	0	0	0
Spotted cucumber beetle	4	0	3	5	2	0	0	1
Tiger beetles	1	0	0	0	0	0	0	0
Giant Water bug	1	0	0	0	0	0	0	2
Southern green stink bug	2	0	0	0	0	0	0	0
Treehoppers	0	0	0	0	0	0	0	0
Protoparce spp. (hornworm moths)	1	1	3	3	10	2	0	0
Salt-marsh caterpillar	3	4	1	3	21	10	13	1

GRB

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BIOLOGICAL RECORD

NUISANCE PESTS

CHIGGERS

(Average Number Per Chigger Board-Counts Made Once Per Week)

July 4		July 11		July 13		July 23		July 28		Aug. 3		Aug. 10	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
2	2	0	0	0	0	0	0	1	0	0	0	0	0

Aug. 19		Aug. 26		Sept. 1		Sept. 11		Sept. 14		Sept. 23		Oct. 5	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

NUISANCE PESTS

MOSQUITOES

(Total Larvae Per Five Dips-One Collection Weekly)

July 11		July 15		July 24		July 30		Aug. 5		Aug. 14		Aug. 21	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	4	3	18	5	25+	25+	0	0	5	0	7	0	0

Aug. 25		Sept. 2		Sept. 9		Sept. 16		Sept. 23		Oct. 5	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

NUISANCE PESTS

TABANIDS

(Average Number Per Animal-Counts Made Once Per Week)

June 12		June 16		July 4		July 11		July 16		July 20		July 28		Aug. 5	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
1.6	1.2	.4	.4	0	.4	.4	.2	1.25	.75	1	.6	1.25	1.0	.5	1.0

Aug. 11		Aug. 18		Aug. 24		Sept. 1		Sept. 11		Sept. 14		Sept. 24		Oct. 5	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
.75	1.0	2.0	0	0	.25	.2	1	1.5	1.4	.2	0	0	0	0	0

S1=Sample One
S2=Sample Two

GRB

BIOLOGICAL RECORD

NUISANCE PESTS

TICKS

(Adults and Nymphs Per Ten 100-Foot Drags-One Collection Weekly)

June 18		June 25		June 26		July 2		July 11*		July 13		July 20		July 29		Aug. 3	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	0	0

Aug. 10		Aug. 18		Aug. 24		Aug. 31		Sept. 11		Sept. 14		Sept. 23		Oct. 5	
S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

S1=Sample One
S2=Sample Two

*Only one sample taken.

GRB

1964 WEATHER DATA GRB

MAY

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	75	56	–	–	0
2	80	62	–	–	.70
3	80	58	–	–	0
4	81	61	–	–	0
5	81	61	–	–	0
6	84	61	–	–	0
7	84	67	–	–	0
8	85	66	–	–	T
9	87	69	–	–	0
10	80	68	–	–	.10
11	86	71	–	–	0
12	85	64	–	–	.05
13	84	55	–	–	T
14	79	53	–	–	0
15	78	51	–	–	0
16	83	54	–	–	0
17	87	57	–	–	0
18	90	59	–	–	0
19	93	63	–	–	0
20	93	68	–	–	0
21	92	66	–	–	T
22	95	66	–	–	0
23	92	68	–	–	.16
24	85	68	–	–	0
25	90	67	–	–	0
26	94	69	–	–	0
27	97	70	–	–	0
28	97	74	–	–	.02
29	88	53	–	–	T
30	80	58	–	–	.03
31	78	61	–	–	.42

JUNE

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	64	58	–	–	.17
2	76	55	–	–	0
3	82	59	–	–	0
4	83	56	–	–	0
5	89	58	–	–	0
6	89	63	–	–	0
7	89	63	–	–	0
8	94	69	–	–	0
9	93	70	–	46	0
10	96	76	98	41	0
11	97	74	98	32	0
12	100	75	97	38	0
13	99	75	91	37	0
14	96	76	88	36	0
15	97	53	98	36	0
16	97	76	100	45	.07
17	90	71	100	40	0
18	94	71	94	38	0
19	95	75	92	40	0
20	96	76	92	40	0
21	96	69	94	38	0
22	99	74	94	32	0
23	101	76	90	47	.85
24	94	73	100	26	0
25	93	65	78	29	0
26	94	64	72	34	0
27	95	72	93	40	0
28	95	70	92	32	0
29	95	74	97	46	.07
30	94	70	100	54	0

1964 WEATHER DATA GRB

JULY

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	88	70	100	46	.88
2	92	72	100	50	T
3	87	69	100	64	.47
4	84	69	100	48	T
5	93	73	100	40	0
6	98	76	97	41	0
7	99	73	99	30	0
8	100	79	92	32	0
9	101	73	100	60	0
10	90	68	100	61	.56
11	90	74	100	70	T
12	86	76	100	56	0
13	88	67	100	32	0
14	82	58	100	30	0
15	90	66	96	48	.95
16	91	68	100	44	0
17	92	67	100	38	0
18	94	71	99	34	0
19	94	69	100	34	0
20	98	73	96	40	0
21	98	75	–	37	0
22	97	74	96	35	0
23	95	71	99	38	T
24	95	72	100	44	0
25	95	74	100	40	0
26	96	73	97	52	0
27	93	70	100	46	T
28	93	73	100	48	0
29	93	75	98	52	0
30	92	72	100	56	.65
31	92	72	100	44	.35

AUGUST

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rain-fall
1	95	72	100	50	.05
2	91	71	100	44	0
3	95	73	100	42	T
4	99	75	98	30	0
5	102	75	96	44	T
6	95	72	100	36	0
7	95	73	100	40	0
8	96	74	100	44	0
9	94	71	100	44	0
10	95	73	100	–	.05
11	95	75	100	52	.22
12	93	72	100	50	.05
13	80	58	100	38	.05
14	82	63	100	50	0
15	86	69	–	–	.13
16	88	69	100	63	2.50
17	76	66	100	82	.03
18	81	63	100	60	0
19	84	61	100	62	0
20	88	68	100	44	0
21	90	73	99	52	T
22	90	68	98	58	.06
23	84	72	97	64	0
24	88	71	99	60	T
25	88	71	100	57	.20
26	90	68	100	50	.05
27	87	65	100	52	0
28	90	71	100	44	0
29	93	71	100	42	0
30	94	73	100	36	0
31	96	69	100	44	.01

1964 WEATHER DATA GRB

SEPTEMBER

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rainfall
1	95	71	100	42	0
2	95	66	98	30	.21
3	94	64	100	32	0
4	96	70	100	37	0
5	96	69	100	40	0
6	95	70	100	38	0
7	92	71	100	50	.08
8	88	67	100	40	0
9	92	65	100	30	0
10	94	61	100	30	0
11	94	68	86	34	0
12	95	60	80	28	0
13	82	52	80	28	0
14	79	49	86	26	0
15	85	51	96	30	0
16	88	64	92	48	0
17	86	68	100	70	.09
18	82	70	100	42	.01
19	88	62	100	40	0
20	90	64	100	40	0
21	92	69	100	40	0
22	93	69	96	42	0
23	92	68	100	45	0
24	88	59	92	23	0
25	83	50	94	22	0
26	85	58	78	26	0
27	88	64	97	58	0
28	86	53	100	100	3.5
29	60	53	100	94	.75
30	66	58	100	73	0

OCTOBER

Date	Temperature Max.	Temperature Min.	Humidity Max.	Humidity Min.	Rainfall
1	80	63	100	70	0
2	82	68	100	70	0
3	76	66	98	81	0
4	72	58	100	36	0
5	64	50	72	34	0
6	63	40	100	30	0
7	68	36	100	28	0
8	75	40	100	34	0
9	64	48	100	40	0
10	67	38	98	28	0
11	71	37	100	24	0
12	76	40	100	37	0
13	74	46	100	41	0
14	62	58	100	86	0
15	66	50	100	62	.68
16	77	48	100	44	0
17	84	55	100	40	0
18	84	52	100	46	0
19	62	42	90	22	0
20	64	34	100	26	0
21	76	38	100	22	0
22	78	42	100	30	0
23	69	45	72	28	0
24	72	40	98	28	0
25	75	38	100	28	0
26	76	44	100	40	0
27	80	50	100	50	0
28	79	54	100	50	0
29	80	52	100	48	0
30	72	50	100	30	0
31	72	42	100	34	0

All human blood sample cholinesterase levels were determined by the standard Michel method and are reported in mean delta pH/hour. The second sample (October 6) on personnel at site SRA-B was not taken due to circumstances beyond control of the individuals involved.

All bovine and equine blood sample determinations were made after diluting buffer solutions used in the standard Michel procedures. This was done in order that the mean delta pH/hour would fall within a suitable and workable range. Since there was no known source of normal average levels for these animals and no preexposure levels were determined, these data will only serve as an indication of seasonal fluctuations. Additional blood samples will be drawn early in calendar year 19[illegible] and again through the summer months.

Blood Cholinesterase Determinations

All human blood sample cholinesterase levels were determined by the standard Michel method and are reported in mean delta pH/hour. The second sample (October 6) on personnel at site STA-B was not taken due to circumstances beyond control of the individuals involved.

All bovine and equine blood sample determinations were made after diluting buffer solutions used in the standard Michel procedures. This was done in order that the mean delta pH/hour would fall within a suitable and workable range. Since there was no known source of normal average levels for these animals and no preexposure levels were determined, these data will only serve as an indication of seasonal fluctuations. Additional blood samples will be drawn early in calendar year 1965 and again through the summer months.

Cholinesterase Study - 1964

Area	Species	Identification No.	Sample No. 1 - Aug 31 Erythrocytes	Sample No. 1 - Aug 31 Plasma	Sample No. 2 - Oct 6 Erythrocytes	Sample No. 2 - Oct 6 Plasma
GRB	Bovine	0-1	.53	.30	.50	.33
		0-2	.54	.33	.62	.30
		0-3	.22	.18	.43	.21
		0-4	.50	.35	.40	.32
		0-5	.71	.28	.62	.30
		0-6	.40	.21	.47	.28
		0-7	1/		.44	.25
		0-8	1/		.60	.31
		0-9	1/		.37	.27
		0-10	1/		.42	.32
		0-11	1/		.53	.30
		0-12	1/		.17	.22
GRA-B	Human	WFH-1	.35	.84	.30	.45
		DNM-2	1/		.46	.42
SCA-B	Human	JHM-3	.60	.88	.44	.42

Area	Species	Identification No.	Sample No. 1 - Aug 31 Erythrocytes	Sample No. 1 - Aug 31 Plasma	Sample No. 2 - Sep 21 Erythrocytes	Sample No. 2 - Sep 21 Plasma
CHA-B	Human	DCM-1	.47	.61	.38	.26
		WLS-2	.37	.58	.39	.45
STA-B	Human	GFK-1	.31	.51		
		BRH-2	.39	.49		
FBA	Mare	417	.38	1.01	.38	.43
	Colt	472	.34	.72	.45 2/	.84
	Horse	470	.27	.84	.50 2/	.94
FBB	Human	JHD-1	.35	.59	.32 2/	.55
FBA	Human	GND-1	.45	.82	.43	.47

1/ Sample hemolyzed
2/ Hemolyzed but resampled 10/26/64

[illegible]

Relation of Pesticides to Honey Bee Colonies on Plots GRA and GRB

Two colonies of honey bees were placed on each plot June 11, 1964. A dead bee trap, designed to collect the bees that die inside the colony was placed on one colony. A pollen trap, designed to strip pollen pellets from the legs of incoming bees, was on the second colony.

Dead bees were collected daily. Pollen was collected from the trap and fresh nectar from the combs at bi-weekly intervals. Honey and live bee samples were taken intermittently from the hive.

The daily number of dead bees, shown elsewhere, increased following insecticide applications on cotton. The mortality was heavy the first 24 hours after application.

At GRA the original population of about 40,000 bees per hive was reduced to about 30,000 during most of the period from July 20 to September 1. At GRB the populations were reduced to about 25,000 bees.

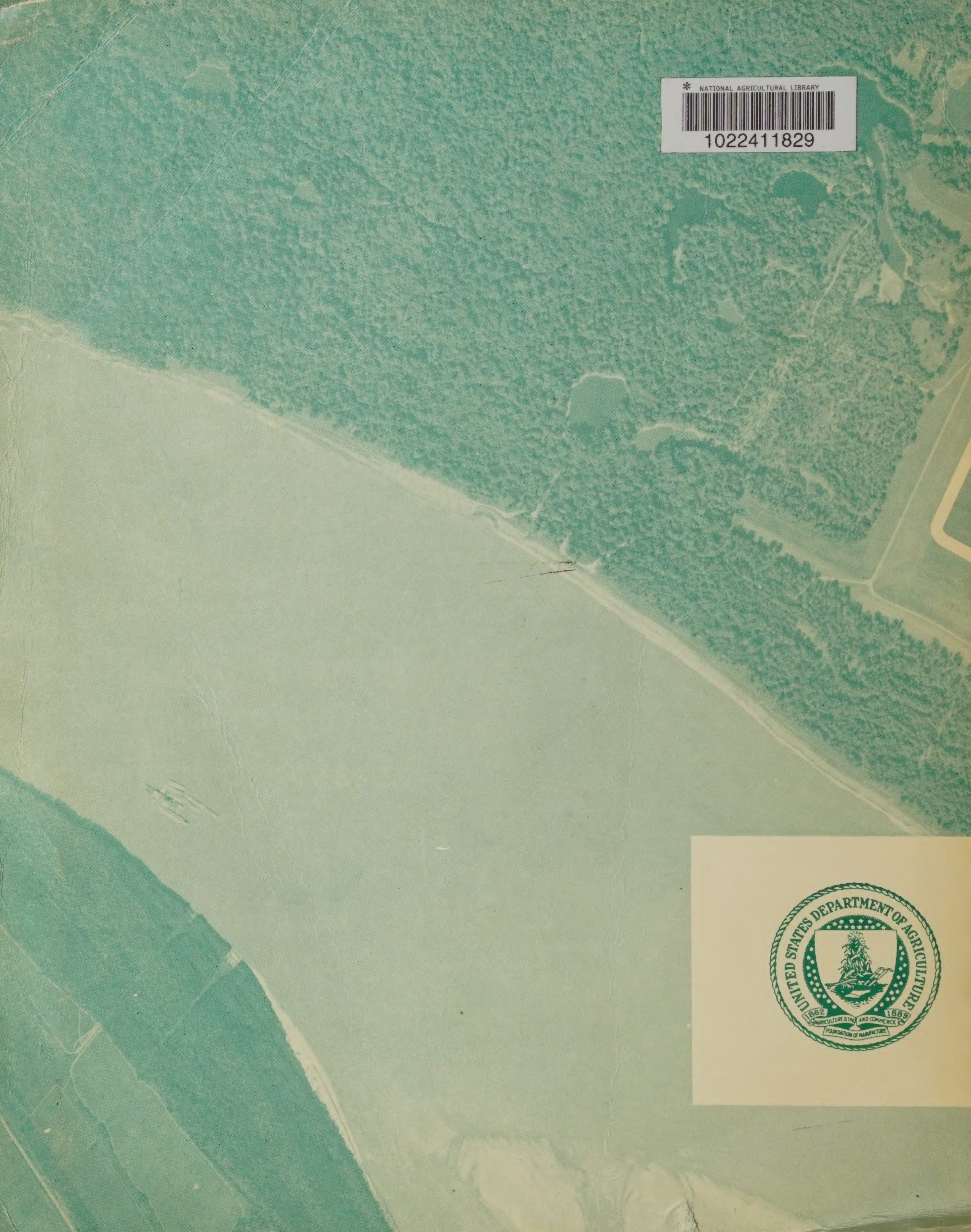
After insecticide applications ceased in the cotton fields a slight loss occurred from insecticide treatment of soybeans.

From June 11 to September 21 the colonies at GRA gained about 100 pounds of honey each and those at GRB about 80 pounds. This is not necessarily the net surplus, nor does it indicate what the surplus might have been without exposure to insecticides.

A favorable fall climate has allowed all colonies to rebuild their populations, but GRB colonies do not have enough stored pollen for early spring build-up.

The latent effect of the damage or of any pesticide stored in the hive on colony development this winter or next season is unknown.

(Entomology Research Division)



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